Community Warning Systems:

Factors influencing citizen decision-making

Stephen L. Guillot, Jr.

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University of South Wales
Pontypridd, Wales, UK

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Table of Contents

Table of Contents

Table of Contents

Abstract

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The ability to alert/warn all segments of a community regarding the potential of severe weather is essential for the safety and well-being of those affected. Such alerts/warnings must be tailored to accommodate all facets of the diverse population within communities. Essential to this is the construction and conveyance of a clear, concise message that identifies and encourages adequate, appropriate protective actions to be taken. This can be accomplished through the concerted efforts of communities to improve levels of preparedness with public education and outreach programmes, via collaboration of broadcast media, broadcast meteorologists and emergency management.

Electronic web-based surveys were made available to the general public, to broadcast media and to emergency management personnel to collect quantitative data related to severe weather warning systems information. Qualitative data was obtained through the convening of six focus groups (three general public groups, one broadcast media group, one meteorology group and one emergency management group).

The key results of this research indicated the need for: a broader community outreach and education programme related to severe weather; a comprehensive severe weather exercise programme; improvements in the NOAA Weather Radio and the Emergency Alert System (EAS); standardized back-up generators for broadcast radio; enhancement of the existing power grid; along with the need for increased capabilities of broadcast media and emergency management to alert and communicate with the non-English speaking and hard-of-hearing communities.

In conclusion, this research indicated a continuing need for community education related to severe weather. In addition, there is also a need for standardization of initial disaster messages, along with conformity in the display of specific graphics and colours by television meteorologists.

Dedication

Dedication

This thesis is dedicated in loving memory to:

Joyce M. and Stephen L. Guillot

and

Gerald J. Schexnayder

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List of Tables

List of Tables

General Public

Broadcast Media

Emergency Management

List of Figures

List of Figures

Chapter 1: Introduction

1.1 Overview

This study explores important aspects of the severe weather phenomenon in association with related responses and preparedness levels of emergency management, broadcast media, meteorologists and the public. This, along with a review of existent precautionary and preparatory measures in place, constitutes the broad scope of this research within a representative sampling of the population. Data, both quantitative and qualitative in nature, was evaluated with particular regard to knowledge/experience, levels of preparedness, perceived risk and communication strategies.

Of immense importance in this realm is the community warning system and its function as a key element to successfully alert/warn the general public of severe weather with potential to impact the community. With a multitude of varieties of warning systems in place throughout the various communities included in this study, factors affecting methods and manner of severe weather notification of the general public by broadcast media, broadcast meteorology and emergency management are investigated in this research. A vital requirement of a well-functioning community warning system is the conveyance of a clear, unified message. It is imperative that the public understand potential risk conveyed by the alert/warning and react accordingly. The severe weather alert/warning must be sufficiently clear and distinct that there is no question as to the appropriate level of protective action that should be taken.

Within the sampled communities of the Metro Davidson-Nashville, Tennessee area, 14 tornadoes, resulting in one death, 68 injuries and an estimated $111.8M in damage (NOAA, 2012d) were experienced between the years 1997 and 2007. During that same period, the entire state of Tennessee experienced 300 tornados, causing 87 deaths and $617.1M in damaged property in total.

The purpose and intent of this thesis is to glean a more thorough understanding of message conveyance and reception, identification of primary factors leading to appropriate responsive actions, and of related critical shortcomings - all of which directly impact the manner in which the target audience responds. The findings contained herein will contribute to determinations for recommendations of the implementation of enhanced citizen emergency decision-making processes, identification of areas applicable for greater community integration and the establishment of a basis for further future study and research.

1.2 Research Question

Stating the hypothesis, ‘There is a direct, proportionate relationship between individual knowledge/experience and the level of personal preparedness of the population within the state of Tennessee’, the following are focal points of the research inquiries:

- Knowledge/experience levels of given populations regarding the tornado warning system
- Level of preparedness within given populations

- Perception of risk within given populations
- Effectiveness of existing emergency alert/notification communication strategies

1.3 Literature Review:

A number of areas related to severe weather information enhancements and improvements have been the focus of researchers across the country, including warning system design (Drabek, 1985), identifying specific design parameters for coverage areas, protective response (Lindell and Perry, 1987), delineating proper response actions affecting safety for receivers, alert and notification factors, warning technologies (Sorensen, 2000), identifying advances in warning target areas, increased communications inter-operability and overall technology improvement and reliability.

Prior research and anecdotal information underscore the need for the delivery of accurate information in a timely manner. This information should not only specify pertinent details of the imminent threat, but also provide instruction on the appropriate responsive action that should be taken by the receiver (Quarantelli, 1980; Lindell and Perry, 1987; Sorensen, 2000). Many factors, including social-structure, psychological effects, timing and cognitive reaction play a significant role in determining the effectiveness of a warning system and the protective responses taken (Mileti and Sorensen, 1987b). Warning systems have been established for various types of situations with hazardous potential and these systems have evolved in complexity with varying degrees of effectiveness. Although, in general, warning integration has not shown significant increases over the past 20 years, the ability to issue warnings more quickly and efficiently has improved, much to the credit of advances in warning technology (Sorenson, 2000). The multiplicity of external and internal factors identified by Drabek (1985), Sorenson and Mileti (1989), Sorensen (2000), Lindell and Perry (2004) and others, reflects the complex environment faced when actuating warning system processes.

Although we know much about the important, integral components of community warning systems, as well as the related factors that may impact the efficacy of these systems, we still do not clearly understand the ways in which these components and factors relate to the contextual nature of the locale of the system (Mileti and Sorensen, 1990b, 1990c, 1990d). Understanding in detail how variable factors and system components interact with hazard occurrence fluctuations, socioeconomic changes and warning dissemination, in addition to contextual factors of the locale, with response to outcomes, remains unclear. However, knowledge and awareness gained from studies related to factor influences' effect on decision outcomes, with regard to protective action, can assist emergency planners and managers in better preparing warning messages (Sorenson, 1991). This brings added emphasis for the need to develop a comprehensive national warning strategy in an effort to minimize system variance related to quality and equitable degrees of coverage (Sorensen, 2000). Consequently, more knowledge is needed to better understand the processes, shortcomings and challenges related to the identified factors and integral components of warning systems.

1.4 Methodology:

Cross-Sectional Web-based Surveys

During the survey period of the years 2007, 2008 and 2010, electronic surveys were developed and conducted to assess the responses of the general public, broadcast media and emergency management. The Nashville Metropolitan Statistical Area (MSA) was the target audience for the general public surveys, with the broadcast media and emergency management agencies surveyed throughout the state of Tennessee. Statistical Package for the Social Sciences (SPSS) was used to analyse the quantitative data collected from the Cross-Sectional Web-based Surveys.

Phenomenological Qualitative Focus Groups

As representative sampling, focus groups were recruited to encompass the general public (i.e., under-served, public-at-large and Spanish speaking), broadcast media, meteorology and emergency management. The manner in which these focus groups were conducted followed a standardized structured format. To analyse the qualitative data collected for the Phenomenological Qualitative Focus Groups, Atlas ti was used.

1.5 Methods Utilized

Data Collection Method(s):

Cross-Sectional Web-based Surveys

Using the Survey Monkey website software, the electronic web-based surveys were posted on the internet for a period of 45 days, after which the collected data was entered into a Microsoft Excel spreadsheet, cleaned and then coded.

Phenomenological Qualitative Focus Groups

A script was prepared with pertinent questions to be posed to the focus group participants. Each focus group session was recorded and transcribed, with the transcriptions placed into Atlas ti for analysis. Each participant signed an informed-consent document to allow disclosure and reference of transcribed statements.

1.6 Ethical Considerations

To ensure confidentiality of respondents, demographic data collected did not divulge identification of individual respondents. Prior to any attempt to collect data for this study, approval was obtained through the Internal Review Board (IRB) of the University of Glamorgan.

1.7 Data Analysis/Results

Quantitative Analysis

A review of the quantitative results of the responses of the public, broadcast media and emergency management surveys were assessed in this section of the study. The number of respondents interviewed in the three years of this research project totalled 5,794. The tables throughout the results section reflected the valid total for each question. There were 2,254 respondents in 2007, 2,161 in 2008 and 1,379 in 2010 from the general public surveys. 45 radio stations and 21 television stations responded to the broadcast media portion of the survey. 95 responses were received from respondents of the emergency management survey.

Qualitative Analysis

To elicit information that could be instrumental in the development of improved community preparedness, six focus groups were conducted using a semi-structured schedule of questions. Focus group participants were obtained using a convenience sampling method. These groups were as follows:

1. Public Focus Group #1 - Low-income government housing and senior living
2. Public Focus Group #2 - Public at large
3. Public Focus Group #3 - Non-English speaking population
4. Broadcast Media Focus Group #4
5. Meteorology Focus Group #5
6. Emergency Management Focus Group #6

1.8 Discussion Section

The findings of this study are presented through the assimilation of information derived from an inductive, objective perspective, with specific results of the study incorporated therein. Inferences will be drawn from existing concepts, theory and operational protocols linking the study results with the existing literature.

1.9 Conclusion/Recommendations

Advancements in technology have enhanced the ability of broadcast media, broadcast meteorology and emergency management agencies to alert/warn the general public with greater speed and accuracy than has been possible at any previous time. Recognition of the needs of a diverse population and the ways in which the community warning system can be improved correspondingly, are important focal points of this study.

Continual improvement in community education related to severe weather events should be an on-going objective, with better comprehension through standardization of initial disaster messages, geo-targeting messages and colours displayed on television.

Chapter 2: Literature Review

Although scientific research related to climatological and geological phenomena has been taking place for centuries, the study of disaster related occurrences is relatively new. Even though some research into disaster response behaviour has been conducted since the early twentieth century (Prince, 1920), the seminal studies occurred in the 1960s through the 1990s. This initial research did much to define the foundational concepts and the scope of warning systems.

The serious study of disaster response behaviour, the adjoining factors and the theoretical components of a warning system process is in its infancy. Generally, research to date has focused on hazard specific response behaviours using data from hurricane evacuation (Moore et al., 1963; Baker, 1979; Carter, 2008) and earthquake events (Palm, 1981; Turner and Killian, 1987; Mileti et al., 1990; Farley et al., 1993). Fewer studies have focused on tornadic hazards (Aguirre, 2000; Balluz et al., 2000; Golden and Adams, 2000; Hammer and Schmidlin, 2002; Paul et al., 2003), flooding (Handmer et al., (1990) and volcanoes (Perry et al., 1982; Perry and Godchaux, 2005). Currently more emphasis is being placed on an “all-hazard” approach to emergency and disaster management.

This chapter will explore the research devoted to system design, response functionality and response behaviours as they relate to the general area of warning systems and processes. The literature comprises three major areas of concentration: 1. warning systems, content and component factors; 2. receiver population characteristics; and 3. technology’s impact on warning response behaviours. Although each area is inherently intertwined with the other two, the majority of research related to this thesis is concentrated in the areas devoted to the formulation, content and delivery of the warning message and the population characteristics of the warning receptors.

2.1 Warning Structure

In 1990, Mileti and Sorensen published a comprehensive compilation of more than 200 study profiles addressing the structure of emergency weather warnings; individual and collective cognitive processes; the social context of decision making; the protective response patterns associated with warning systems. This document provided a social science approach to the effectiveness of warning system functionality and a basis for understanding the design and technological aspects that comprise an effective warning system. Mileti and Sorensen, (1990a) clearly established a scientific and social process involved in the systematic detection, warning and behavioural response aspects of disaster warning research.

The organizational aspects of warning systems were initially explored by Anderson, (1969), but since that time numerous studies have advanced the theoretical basis of organizational structure relating to warning processes (Perry et al., 1981; Drabek, 1999; Balluz et al., 2000; Perry and Godchaux, 2005). For the most part, design specifics are based on a relatively consistent model using three basic subsystem components: 1. hazard detection, 2. emergency response and 3. public response (Sorensen and Mileti, 1989).

The technological breakthroughs in the detection of certain hazards have significantly advanced over the past years. The increase in warning times for both hurricanes and tornadoes has given substantially more notice to the public, allowing additional time for taking protective actions (Golden and Adams, 2000; Carter, 2008). Although the physical nature of tornadoes does not allow for much detection time compared with hurricanes, the development and implementation of more sophisticated radar and analytical capabilities has increased notification times from 3-4 minutes to 10 minutes and in some cases as much as 30 minutes before a tornado strikes a specific location. As the detection science for other hazards, such as earthquakes, volcanoes, avalanches and floods, becomes more precise, detection of those hazards will have a positive impact on the ability of the other two warning components to function more effectively and efficiently (Paul et al., 2003).

The detection of an impending hazard triggers a set of decision making considerations, stimulating the implementation of the second subsystem related to the emergency management (EM) or response function. Here, both subjective and objective analyses of the data and situational perception play major roles. Once the hazard identification (detection) occurs, the EM component must assess the level of threat posed by the hazard. Depending on the analysis, a notification or alert is disseminated to the public through an alert message. The construction, transmission and reception of the message comprise a complex warning system context (PWW Report, 2002-02), a complex interaction and integration of hierarchical and lateral communication and decision making, usually involving an intertwined network of multijurisdictional and multiagency functions.

Broadcast media outlets have improved their capability to deliver a more accurate forecast to the general public, using both advanced technology (e.g., radar, GIS, forecasting consultants) and their relationship with the National Weather Service (NWS). During severe weather outbreaks, the NWS provides updates as needed to the broadcast meteorologists; therefore, the meteorologists are able to provide more accurate and timely severe weather information to their viewing/listening audience. Broadcast meteorologists use graphic information systems (GIS) and computer software programs to improve the way information about severe weather is communicated to the general public on television. With improvements in technology, broadcast meteorologists are able to report severe weather phenomena in a manner that most of their viewing/listening audience can understand, enabling them to take the appropriate protective actions.

The third component of the subsystem is the public response. This component incorporates an array of sociological factors and characteristics that affect individual behaviour regarding the adoption of preparedness and mitigation activities, resulting in proactive, reactive, or non-active responses to a hazard notification. The reception, legitimatization, or disregarding of the warning message has a direct impact on the life safety outcomes of those facing the hazard. Confirmation of the warning is a critical element in taking a course of action consistent with positive results regarding public safety (Drabek, 1999).

The following sections will discuss each of the components of the warning structure in more detail.

2.1.1 Detection Subsystem

The detection function of the warning system consists of four elements: 1. monitoring of climatic or geophysical phenomena; 2. detection of a potential or actual hazard; 3. assessment and analysis of data; and 4. prediction of hazard activities. Depending on the hazard, the technology used for detecting and monitoring will vary according to the pertinent science. Tornado forecasting and monitoring methods have existed since the nineteenth century, but most modern day attention began with a serious focus during the 1940s as a result of U.S. air force interest in the subject (Doswell et al., 1993). Early on, the primary means of tornado monitoring was using radar enhancement of storm-scale processes. Most of the emphasis was on empirical methods, but as the research progressed a bifurcated process developed within the tornado monitoring/forecasting arena, splitting between research and operational focuses. This split widened as tornado research expanded into a storm-environment relationship (Weisman and Klemp, 1982, 1984). The storm-environment relationship involves numerical cloud modelling, Doppler radar and a “storm chase” team of meteorologists who relay first-hand information to the National Weather Service.

As the research progressed into the 1960s, Browning and Fujita, (1965) added significant knowledge to the study of ‘super cell’ formations and the role these play in the formation of tornadoes and tornadic activity. During this time, Fujita developed the ‘Fujita Scale,’ which is currently used to determine the strength of tornado wind speed (Fujita, 1963). The creation of the National Severe Storms Laboratory (NSSL) in 1964 signalled the beginning of weather radar research and development (Sanders, 1963). NSSL spearheaded the research efforts that resulted in the development of Doppler radar technology and subsequently became the core component for developing the WSR88-D radar, or NEXRAD. Currently, this system is the cornerstone and organizational foundation of the National Weather Service (NWS) (Friday, 1994). Researchers have found that this technology has had a direct impact on improving the accuracy of locating tornadoes and increasing warning times (Klazura and Imy, 1993; Polger et al., 1994).

The current system for monitoring tornado activity has evolved into an elaborate and complex coordinated system developed around the WSR88-D radar. The operation of this radar system under the umbrella of the NWS is a coordinated effort between the NWS, U.S. Department of Defence, U.S. Department of Transportation, Automated Surface Observing Systems (ASOS) Geostationary Operational Environmental Satellites (GOES) 8 and 10 and the Automated Weather Interactive Processing System (AWIOS). Data derived from this network assist researchers in forecasting and providing warning information for severe weather across the country (Wilson et al., 1999). As a result of his studies involving 3D numerical modelling of tornadoes, Golden and Adams, (2000) illustrates the extensive use of data gathered as a result of the implementation of the current network. Golden and Adams's studies incorporated the empirical observations of storm chasers related to tornado structure and wind field. Currently, related modelling research is being conducted at the University of Oklahoma using Doppler-winds and upper-air sounding information.

Hurricane monitoring has evolved into a highly sophisticated detection and monitoring science. Hurricane tracking is a highly studied phenomenon (Sheets, 1990; Franklin et al., 2000; Powell and Aberson, 2001) related to forecasting accuracy and predicting the “strike” area. The hurricane study reviewed forecasting trends of the National Hurricane Centre 12, 24, 36, 48 and 60 hours prior to landfall. Franklin’s study is an attempt at defining the gap between the McAdie and Lawrence, (2000) and Powell and Aberson, (2001) studies that addressed forecast accuracy. Franklin’s study analyses the two verification methodologies used by McAdie and Lawrence using data covering the Atlantic basin as a whole) and Powell and Aberson (who restricted their analysis to forecasting tracks making landfall or passing within 75 kilometres of the coastline) by posing two questions: 1. What are the long-term trends of National Hurricane Centre (NHC) forecast errors for storms threatening the coastline? and 2. Are these forecast trends detectably different from basin wide trends? Franklin concludes that because of the variance in current data ‘…it is difficult to assess [the distribution of the hazard] from the official forecast track alone’ (p.1202). Thus, because of this uncertainty, protective actions involving life and property should remain tied to current watch and warning processes used by the National Hurricane Centre.

Tornado and hurricane detection and monitoring scientists use distinct instrumentation and methods and other hazard research scientists have also developed unique capabilities within their detection and monitoring systems. Each varies in forecasting accuracy, warning parameters and sourcing distinctions, as they do for tornadoes and hurricanes. The U.S. Geological

Survey literature lists four types of volcano monitoring methods currently in use: Electronic distance meters (measure distance between benchmarks placed on a volcano) (Iwatsubo, 1992); tilt meters (measure changes in the slope angle of the ground) (Dvorak and Okamura, 1987, Harding et al., 1994); global positioning system (GPS) (pinpoints horizontal and vertical movement of the ground in real time) (Dixon, 1993); and satellite radar interferometry (compares radar-generated images recorded over an extended period that observe deformation patterns) (Goldstein et al., 1993). Because these monitoring methods are highly sensitive and accurate, the dynamics of volcano activity in most cases allow for extended lead time for notifying the public of the threat and the need for evacuation from the risk area.

Earthquake monitoring studies are another area of considerable research emphasis (Feigl et al., 1994; Massonnet et al., 1994; Peltzer et al., 1995). As the research indicates, difficulty in predicting the occurrence of an earthquake poses problems for advanced warning (Turner and Killian, 1987). Although the monitoring science associated with earth movement and plate tectonics is advancing, research in determining the severity of the actual impact in a timely matter is far from precise (CRS Report RL33861[2008]).

Flood hazard monitoring approaches tend to rely on data provided by mapping technology in identifying flood prone areas. Jiren and Yesou, (2006) and Kussul, (2008) studies provide examples of the demonstrated use of space earth observation technology for gathering data and developing modelling platforms used in flood mapping, prevention and forecasting.

Hazard data analysis and prediction capabilities vary with the type of hazard. Doswell, (1993) treatise on tornado forecasting outlines an historical perspective of tornado forecast verification covering the 35-year period from 1955-1989. Focusing on technology and its application to prediction outcome, Doswell explores the formulation of tornadoes through storm environment factors and the recognition of tornadoes once they have developed. As he notes, forecasting in the early 1990s used three general approaches: synoptic pattern recognition, meteorological parameter assessment (checklists) and climatology. Currently, these forecasting parameters are still incorporated in indices. Although expanded through scientific research advances, all generally are associated with synoptic and mesoscale upward motion, sufficient moisture and lapse rate for a parcel to be positively buoyant and vertical wind shear structure (Carbin et al., 2003; Bright et al., 2005; Dean et al., 2006; Guyer, 2006).

2.1.2 Emergency Response Subsystem

The Hurricane Research Division of the Atlantic Oceanographic and Meteorological Laboratory produced over 135 scientific publications related to the technical research area of hurricane forecasting and tracking for the a 10-year period from 1999-2008. The acknowledgement of this technical hazard research leads into the second function of the warning system subsystem: emergency response. Emergency management has a coordination role in the emergency response framework. As the literature is explored, it is evident that the operational responsibility for quickly and accurately analysing hazard data, deciding on what action to initiate and properly forming and disseminating the warning message information correctly to the public will have a significant impact on factors associated with the safety of communities.

Research has found that one factor that contributes to the success of individual preparedness during a disaster is the ability of emergency management to properly notify and inform the public of the nature of the hazard (Regulska, 1982). Drabek, (1986) breaks the warning message into three components: content, source and number. The content contained in the message is crafted for a specific target audience, the source refers to where the message originated and the number refers to how often the receivers get the same message.
The message characteristics developed by emergency management are a key component. Mileti et al., (1990) identifies the fundamental elements for warning content, which must include hazard or risk, guidance, location, time and source. The construction and dissemination of the warning message requires clarity, accuracy and certainty for positive reception and action on behalf of receivers. A primary responsibility of emergency management is to make sure the community is aware of the existence of the hazard.

However, Mileti and Sorensen, (1990a) identified one problem area associated with the flow of information from the detectors to the emergency managers as a possible inhibitor within the warning system process. They found that the information flow between these two entities in emergencies is not without problems and is at times “constrained” because of several factors. One factor involves the uncertainty of the predictions and forecasts from the detectors. Providing inaccurate or misleading information to emergency management poses a series of potential problems (Baker, 1979) that can lead to credibility issues for the public (Doswell et al,, 1993; Blanchard-Boehm, 1998), which not only creates short-term problems, such as delays in seeking shelter from tornadoes (Golden and Adams, 2000; Hammer et al., 2002; Paul et al., 2003) or failure to evacuate in a timely manner during a hurricane (Baker 1979, 1991). This may also have an impact on the credibility of emergency management over a long period (Golden and Adams, 2000). Another factor is communication. The use of technical terminology by the detectors in communications to emergency managers may create confusion and clarity issues. Misinterpretation of data from the detectors may lead to the formulation of erroneous warnings by emergency management to the public. This also affects credibility and could cause confusion and delays (Paul et al., 2003; Lindell et al., 2005). The final factor Mileti and Sorensen, (1990b) address is the detector's decision making process in assessing if, when and who to inform about the data analysis. Development of a clear and precise process for hazard data transmission from detector to the emergency manager is a key component in the overall effectiveness of the warning system.

In studying the importance of risk communication and warning message impact in promoting protective actions focusing on earthquake occurrences, Maddox (Golden and Adams, 2000) uses a risk communication model developed from a compilation of research evolution.

The Maddox weather warning partnership model (Golden and Adams, 2000) outlines the key players for severe weather alerts/warnings. The challenge today is the impact of the internet and cell phone technologies that have greatly affected the ways in which information flows through the system. Some fairly technical products are now available directly to the public on the internet.

Ostby, (1992) provides an in-depth technical perspective of the operations of the Severe Local Storms Unit (SELS) of the National Severe Storms Forecast Centre and its work in forecasting tornado and severe storm data. Ostby, (1992) defined meteorological diagnosis of data performed at SELS and the watch preparation and dissemination process. The integration of the technological advances with the operational element of the system has led to dramatic improvements in accuracy of forecasting and subsequent distribution of that data to emergency managers. Significant improvements in the NWS warning program and preparedness efforts at the local weather service office, as well as safety and preparedness programs carried out by emergency managers, volunteer spotters, ham radio operators and the media, resulted in a more enlightened public. All these groups contributed to this positive trend.

In her study of the 1989 Loma Prieta, California, earthquake, Blanchard-Boehm, (1998) focused on three areas: 1. message characteristics as they pertained to the degree to which individuals heard, understood, believed, confirmed and/or responded to non-emergency warning messages; 2. receiver characteristics prompting individuals to increase their perception of future earthquake risks; and 3. model viability relative to individual hearing of and responding to natural disaster risk. The findings indicated that receiver characteristics were more significant in the risk communication process than were message characteristics. Contrary to the Handmer and Penning-Rowsel, (1990) viewpoint of a failed system, Blanchard-Boehm also tested information produced by the U.S. Geological Survey to determine risk impact of information (in this case, written publication) about future earthquake occurrences. Research indicated a significant correlation between published information and successful risk communication. This is consistent with previous research conduct by Rogers, (1985) and Mileti and Sorensen, (1990d).

Using the general hazard risk communication model (Blachard-Beohm,1998), the emergency response subsystem clearly has a major role in the analysis of data, message development and dissemination and the mitigation aspects of the warning process. Blanchard-Boehm, (1998) used a hazards risk communication model in her research related to understanding individual behaviour when acting on warning information.

The general hazards risk communication model is still applicable with today's advanced technology. The model takes into consideration the sender, the receiver and the message. The model also factors in behavioural patterns of the receiver to alerts/warnings.

The design of the typical emergency warning system has maintained a constant structure over the years. The U.S. system uses a bottom-up design, that is, its foundational component is the local government unit. At this level, the warning message is constructed and disseminated to the public and can be susceptible to a number of influences; for example, lack of concise hazard information, guidance directives (Mileti and Sorensen, 1990d), age and life experiences

(Drabek, 1999), threat perception (Perry et al., 1982), or threat denial (PPW Report 2002-02). The research indicates that numerous factors can have a significant role in how, why, when, or if the public takes a proactive, reactive, or non-active role in response to a hazard event (Mileti and Sorensen, 1990b). Culture, ethnicity and other differences in population influence message characteristics and must be considered when developing message content (Lindell and Perry, 2004). Aguirre's, (1988) study of the 1987 Saragosa, Texas, indicates, failure to consider language differences in population can lead to non-responsive behaviours during the onset and occurrence of a hazardous event. Emergency managers who have responsibility for communities with multi-cultural and multi-language populations must consider the minor distinctions that affect warning source credibility (Lindell and Perry, 1992b).

A report published by the Workshop on Effective Hazard Warnings (PPW Report, 2002-02) defines a warning system as '…a complex mix of many critical elements from original data to action' (p.6). The eleven elements relate to data, warning message context and receiver factors. Three of the elements address issues related to the effectiveness of mitigation efforts. The warning process steps used in the study are:

- Data collection and analysis and then the decision to issue a warning
- Framing the warning
- Reliable input of warnings from authorized sources to one or more local and national communication systems
- Transmission to a wide variety of warning distribution systems
- Distribution to user receivers

- Reception by end-user devices
- Announcement of appropriate warnings to end-users
- Decision by the end-user to take appropriate action
- Public education
- On-going evaluation and improvement
- Emergency planning

Warning message design is a pivotal element in the overall warning system. Proper construction of the warning is critical for accurate dissemination of information to the public for eliciting positive receptor assimilation and response. The basic construction elements should include specific hazard and risk information, location, instructions on what to do, reaction time available and the source of the information. Criteria for assessing warning system context have also been identified as important with respect to accuracy, internal consistency and consistency with other sources' messages, completeness, specificity, timeliness, relevance and importance (PPW Report, 2002-02). Defects or deficiencies in any of these elements could render the message unfit for dissemination and require further reconstructive action on the part of the emergency management issuers.

The PPW Report, (2002-02) from the 'Workshop on Effective Hazard Warnings' also provides some insight into lessons learned about warning message content. The six items listed below are based on the accumulated knowledge of the report conferees and the social science related research dedicated to warning message design and development:

- Be as specific as possible about the nature of the threat.
- Recommend one or more specific protective actions.
- Explain to those who are not at risk why they are not believed to be at risk and why they do not need to take protective action.
- Recognize that actions are triggered by changes in threat condition. Develop a plan and systematic procedure for evaluating the need to change the threat condition.
- Use terminology in warning messages that is consistent across time for a given hazard.
- Let people know when the threat has ended so they can resume normal activities as soon as possible.

To understand why and how individuals and groups respond to disaster warnings, it is first necessary to understand the process that stimulates that response. The system for transmitting data from those who detect and monitor hazard potential and development is an elaborate and complex organizational component of the disaster warning network.

The interactive functionality accentuates the coordination and operational connections of response entities and serves as a research framework for pinpointing both system efficiencies and challenges. Other hazard warning systems use similar structures cornerstone by a nationally recognized research hazard institution or centre, incorporating multiple communications and coordinating entities for dissemination of information to the public (Sorensen, 2000).

As warning messaging through the sender (emergency management, public safety subsystem) becomes more precise and technology develops further, enabling emergency managers to assimilate hazard data more efficiently, the safety of the general public should increase. However, Balluz et al., (2000) found that even with recent improvements, inadequate warnings or warning systems remain a major factor in the number of deaths and injuries from tornado hazards. These findings demonstrate the continued need for emphasis on and development of a nationwide warning system and highlight the coordination requirements of multiple factors for successful community safety outcomes.

Edwards et al., (2002) research describes the circumstances surrounding the large tornado outbreak that occurred on May 3, 1999, in Oklahoma and the central plains and the sequential development of the storm and the operational role of the SPC. The study's purpose was 'to focus operational and research attention on the critical forecast issues by documenting their influence on SPC's handling of the 3 May event and to discuss some of the lessons learned' (Edwards et al., 2002, p. # 2). Their work suggested that 1. operational numerical forecast models used during the outbreak gave inaccurate, inconsistent and/or ambiguous guidance to forecasters; 2. varying convective precipitation forecasts and under-forecast wind speeds in the middle and upper troposphere led forecasters to expect a substantially reduced tornado threat as compared to what happened; and 3. as the event approached, observational diagnosis and analysis became more important and were found to be critical in identification of the evolution of the outbreak. Tornadic super cells ultimately developed earlier, were more numerous and produced more significant tornadoes than anticipated.

Other researchers have contributed to the literature on the integration between technical research and operation functionality of the tornado warning system (Hales and Vescio, 1996; Kay and Brooks, 2000; Levit et al., 2004; McCarthy and Tarp, 2005). Although tornado warning has developed into a fairly sophisticated system, increasing warning times to approximately 10 minutes according to recent research (Paul et al., 2003). Lindell et al., (2005) developed an emergency response function allocation matrix associated with current hurricane information communication networks, which delineates the functional components between units of the emergency management system. Based on the system's prospective model as proposed by Mileti et al., (1975a) and Perry et al., (1981) and subsequent research over an extended period (Lindell and Perry, 1992b, 2004; Sorensen, 2000; Tierney et al., 2001), Lindell and Perry, (2004) identifies the four basic functions as emergency assessment, expedient hazard mitigation, population protection and incident management. The emergency response function allocation outlines the responsibilities and functions of different agencies as it relates to alerts/warnings. It is interesting to see how Lindell and Perry, (2004) categorizes the expectations of all aspects of the community. The public receives severe weather information from multiple sources.

In the U.S., the National Weather Service (NWS) is the only official entity authorized to issue tornado forecasts nationwide. Tornado warnings come directly from NWS regional offices located throughout the country. A warning is issued when a hazardous weather or hydrologic event is occurring, is imminent, or has a very high probability of occurring. A warning is used for conditions posing a threat to life or property (NWSG, 2008).The Storm Prediction Centre (SPC) is responsible for issuing tornado watches. A watch is used when the risk of a hazardous weather or hydrologic event has increased significantly, but its occurrence, location and/or timing is still uncertain. It is intended to provide enough lead time so those who need to set their plans in motion can do so (NWSG, 2008).

Broadcast Media

Educating the general public about severe weather is one role of broadcast meteorologists. The general public has come to expect that pertinent severe weather information will be delivered in an accurate, timely and easily interpreted manner. Broadcast meteorologists also communicate protective actions that are necessary in the event of a severe weather outbreak (Mileti and Sorensen, 1990d). Some of the ways that broadcast meteorologists report severe weather phenomena to the general public include breaking into scheduled programming, using crawlers on the bottom of the TV screen and placing a radar image in the corner of the screen.

Past performance and the advancements in technology, broadcast meteorologists have achieved an improved level of trust and confidence from the general public. It is critical that broadcast meteorologists provide severe weather information to the general public in a manner that conveys immediacy, accuracy, collaboration, balance and professionalism (AMS, 2001). Social media also have a role in providing information to the general public; for example, most meteorologists in the Nashville area have Facebook pages.

Broadcast media use the Emergency Alert System (EAS) (FCC, 2012), a national public alerting system, to provide severe weather alerts and emergency information to the general public. This system can be used by the president of the U.S. during a national emergency. The National Weather Service used EAS to provide public alerts and warnings regarding severe weather. The EAS alerts and warning from the National Weather Service are broadcasted on TV, radio and on NOAA weather radios. This system is also used to broadcast AMBER (missing children) alerts.

2.1.3 Public Response Subsystem

The amount of warning and disaster research reflects the number of variables associated with determining whether the public will accept a warning message and take appropriate protective action (Moore 1963; Mileti et al., 1987a, 1990b, 1990d; Heath and Palencher, 2000). Warning message must contain several elements to be considered effective. It must clearly describe the hazard; provide clarity, accuracy and consistency; and be delivered by a credible and reliable source. Concise and accurate data combined with effective warning messaging provide two of the three elements of a hazard warning system. Effective hazard detection and monitoring require the existence of a network for transmission of those data to emergency managers for dissemination to the general public. How that message is received, perceived and acted upon entails a complex system of human behavioural characteristics, which determine the ultimate success of the warning system process.

Disagreement exists in the literature about whether inclusion of all the context elements leads to the adoption of adequate preparedness and response action by the public. Tierney, (1981) suggests otherwise, based on the social context of individual behaviour. Social constraints may cause individuals to react differently based on their perceived freedom of choice in making those decisions (Drabek, 1999). These findings are consistent with earthquake research related to the influence of family and social acquaintances on evacuation behaviour patterns (Turner and Killan,1987; Mileti et al., 1990a; Farley, 1993).

Even with the advances in the development of the current monitoring and detection system, hazard literature shows distinct differences between the operational implementation of data, such as warning message formulation and dissemination (Lindell and Perry, 1992b, 2004; Lindell et al., 2005) and the resulting behavioural responses (Carter, 2008; Drabek, 1986) produced from the various tornado warnings systems found across the U.S. (Cross, 2001).

Research related to both the detection and emergency response subsystems clearly illustrates the integrative characteristics that compose the warning system network. The third part of the system, public response, remains a major focal point of warning system research for social scientists.

Disaster warning research has shown that the communication of public emergency warnings consists of a multitude of complex integrated social, cultural, demographic, economic and psychological factors, which directly and indirectly affect the behavioural response of individuals or groups faced with a hazard incident (Leik et al., 1981 Drabek 1986; Mileti and Sorensen, 1990b, 1990c, 1990d; Farley et al., 1993; Gonzales et al.,1997). Research has also shown that individuals who possess more knowledge of tornado hazards and knowledge of their local geography and who are familiar with the tornado watch and warning system, are more likely to survive a tornado if one is encountered (AMS Council, 2000, 'Tornado Preparedness and Safety'). In a study of a series of tornadoes that struck the Kansas, Missouri and Tennessee regions on May 4, 2003, Paul et al., (2003) found that 89% of survey respondents were aware of the existence of the tornado before it struck their community. Most of the respondents reported receiving both tornado watch and warning notices prior to the tornado occurrence. Although the protective behaviour actions varied, most were consistent with guidelines issued by the National Weather Service. Thirty seven percent of the respondents sought shelter in their basements, 10% moved to interior rooms, 18% went to a storm shelter (e.g., home, neighbour or community shelter), 5% used their motor vehicles to escape the path of the storm (moved in a right or left direction from the tornado, which is the recommended procedure if in a vehicle), 10% went outside to view the tornado before seeking shelter and one individual sought shelter in a nearby ditch. The statistics indicate that 90% of those who heard the tornado warning took some form of the recommended actions during the tornadoes. Lillibridge, (1997) also found a positive correlation between lower tornado-related morbidity and mortality rates and the use of effective warning systems and shelter availability. Paul et al., (2003) found that warning awareness had a positive impact on response behaviours.

The response of seeking shelter during a tornado is documented as a positive step in reducing morbidity and mortality (Noji, 1997). Knowledge of warning system terminology, pre-tornado preparedness, community education and the ability to seek protective shelter all have a fundamental role in the safety aspects attributed to the warning system network. Balluz et al., (2000) explored several factors related to tornado warnings and the correlation of each to proper behavioural response. Their findings found positive correlations among people's taking positive actions with having at least a high school education; having a basement in their homes; receiving a tornado warning upon the impending approach of a tornado; having heard a siren; and having a prepared action plan.

The research into social factors affecting the response behaviour of individuals to hazards is extensive. The literature explores the interrelationship between a specific hazard, such as a tornado, hurricane, flood or volcano and individual response behaviour (Baker, 1991; Edwards, 1993; Ketteridge, 1998) and also focuses on a broader perspective of warning network interactions with the general warning system macrocosm (Blanchard-Boehm, 1998; Heath and Palenchar, 2000; Lindell and Perry, 2004).

In reviewing research conducted by Sorensen, (1993), there are key indicators and clues impacting the level of preparedness and perception to risk. Response behaviour to emergency warnings is a complex socio-psychological process and can be influenced by a combination of factors. Race/ethnicity, income, gender, age and cultural background all contribute to an individual's ability to understand, comprehend, believe and process a warning and act appropriately.

In studying the preferred hazard information sources of three ethnic groups (Caucasians/Whites, African American/Blacks and Hispanics/Latinos), Perry and Nelson, (1991) found that radio, newspapers and television (where available) were common sources of hazard information for all three ethnic groups. Magazines appeared to be a good source of information for whites but to a lesser extent for the African American/Black and Hispanic/Latino communities.

Perry and Mushkatel, (1986) found that African Americans/Blacks and Hispanics/Latinos give higher credibility to hazard warning information about hurricane evacuation notices when the information is received from family, friends and other local (neighbourhood) community members. This is important to emergency managers with large Hispanic populations when designing dissemination mechanisms for those communities. It also provides insight into warning messaging that fails to consider ethnic differences (Aguirre, 1988).

One significant finding was that Mexican-Americans tend to prefer social networks for receiving hazard information more than both white and black groups. This supports Perry and Nelson, (1991) research and is consistent with Gonzalez et al., (1997) findings that also found African American/Black and Hispanic/Latino communities prefer to receive information from personal contacts and interpersonal networks.

Perry and Nelson, (1991) study also identified four key data points, which provide significant information for emergency managers. First, radio was identified as the consistent source for receiving hazard information for all three ethnic groups; second, receiving information from magazines or from speakers at meetings were not considered preferred channels for information; third, neighbourhood meetings were identified as preferred channels for Mexican-Americans; and fourth, both minority groups listed television as the preferred information source. This may mean that the use of multiple methods for disseminating hazard messaging to the public by emergency managers may be more effective than single source distribution.

Contrary to popular belief, there were no mass panic actions associated with disaster hysteria (Quarantelli, 1954). Sixty one percent of the families interviewed made some attempt to confirm the warning information that was disseminated by officials and families who evacuated did so as family units (92% who were united at the time of the warning left together). One interesting finding associated with age in the Quarantelli study contradicted another disaster myth that older individuals fail to heed evacuation warnings more than younger individuals. The study found that older persons are just as willing to evacuate as others are, as long as they have a place to go and are physically able to move. Social relations can also play a role in the responsive actions of individuals or groups based on assessment of warnings. In their study of families involved in large-scale flood disasters, Drabek and Boggs, (1968) found several commonalities within family groups. Perry and Liddell, (1997) research supports this based on data from nine disasters (hazardous materials incidents, floods and volcano eruptions), concluding that age is not a useful predictor of warning compliance.

Research also indicates that economic viability may be a factor, under certain conditions, for determining a person's ability or agreeability to adopt self-protective measures. Palm, (1981) research suggests that risk perception may be overshadowed by financial costs associated with earthquakes. These "cost/benefit" assessments compose a significant element of the individual response process and can be a prominent aspect of decision making, thus affecting the degree to which individuals are able to take proactive self-protective measures (Sorensen and White, 1980; Mileti and Sorensen, 1987b).

Gender is another factor that can affect response behaviour. The traditional role of care-giver, their greater exposure to certain objective risks (e.g., living conditions), evacuation preparedness (e.g., possessing an evacuation plan) and their more acute perception of subjective risk (e.g., perceived personal risk) provide women with higher motivation and perception of danger. Gender is also indicative of the stereotype of men as "risk takers" and women as "risk avoiders" (Leik et al., 1981) and women having a greater perception of risk based on feelings of lack of control and power in society (Flynn et al., 1994). Bateman and Edward, (2002) research indicated that gender contributes to women being more likely to evacuate due to a hurricane warning than men.

2.2 Conclusion

The need for the development of adequate warning systems related to natural hazards is evident by the number of occurrences each year that cause untold damage and deaths. The science of warning response behaviour has clearly outlined the scope and depth to which human reaction is subject to the complex decision processes individuals or groups must undertake to survive a disaster. As the literature indicates, these processes rely on a complex interaction of psychological, social, cultural, economic and physical factors (Anderson 1969; Mileti et al., 1975a, 1975b; Drabek, 1986; Edwards, 1993; Bateman, 2002; Lindell and Perry, 2004). The variances that occur in response behaviours as a result of these factors are often affected by perception of risk, understanding and belief of the warning message, safety issues affecting family and the likely effectiveness of protection measures (Drabek and Boggs, 1968; Lindell and Perry, 1992a).

The complexity of human factors requires a greater enhancement of technological accomplishments and discoveries in an effort to maximize the impact on reducing human uncertainty and decision making when facing disaster. The technical achievements to date have given social scientists the understanding of those aspects of human behaviour that motivate one to respond and seek shelter. The research of Aguirre, (2000) reviewed the warning process is the result of the complex interaction of systems incorporating the physical, technological and social elements of the environment.

As indicated in the literature review, the U.S emergency warning systems are integrated amalgams of technical research and engineering driven by the quest to overcome the scientific mystery of why, how and when natural hazards develop. These natural phenomena directly coincide with human occupation of the planet and often lead to destruction, injury and death. Precipitated by the human need to survive and mitigate the effects of nature, the sciences related to disaster management and the research contributing to the study of human behaviour relative to disasters have evolved in sophistication and precision. The very complexity of human nature provides an unlimited environment for future researchers to explore the interaction of humans and nature and the innate struggle that human existence requires.

This literature review comprises a comprehensive study of alerting/warning capabilities and capacities involving the public (low-income, public at large and the Hispanic/non-English speaking) (receivers), emergency management (senders) and broadcast media (senders). In addition, this study has reviewed the existing severe weather threat, identified level of preparedness, indicated the perceived risk associated with severe weather and acknowledged the existing alert/warning systems available to the public, broadcast media and emergency management. Deficiencies have been identified in disaster preparedness within the Hispanic/non-English speaking community. Gaps have been identified within existing systems used by emergency management and broadcast meteorologists to improve alerts/warnings for the public.

Chapter 3 – Methodology Section

3.1 Introduction

Severe weather warning research is an expansive topic, incorporating such diverse aspects as behavioural patterns related to sender and receiver perceptions, adaptations, and actions; technological innovations, concepts and theories involving the physical sciences; and warning system design and organizational implementation. Various methodologies, both traditional and non-traditional, can be employed in academic and applied research to explore these factors. This chapter describes the study design, instruments used, research design, populations, survey procedures followed and focus group procedures followed.

3.2 Study Design

3.2.1 Cross-Sectional Web-based Survey

The expansion of internet technology since the mid-1990s has allowed researchers to explore and take advantage of opportunities using electronic survey modes. This recent growth has even led some researchers to speculate that the use of the internet, in the form of web-based surveys, may soon become the primary data collection method (Shannon et al., 2002).

Selecting the appropriate methodology from numerous choices for collecting data provides many challenges for researchers. In traditional experimental or quasi-experimental designs, having a great deal of control over the participant's length of, quality of or location of exposure to a stimulus. The use of internet or web-based survey modes eliminates control for these variables. Some more traditional theorists conclude that web-based proponents are only using an existing paradigm and applying it to a new technology devoid of methodological concepts or scientific processes (Dillman et al., 2009).

The bias of survey methodology will be fully acknowledged in the appropriate context, but the advantages will be fully utilized with the realization that, as a relatively new data collection method, web based surveys offer extraordinary versatility and flexibility while providing a viable research platform to be explored and challenged (Couper, 2000, Archer, 2008). A web based survey can be developed and available in days. The data is collected constantly and then imported into a spread sheet allowing for immediate data retrieval (Fleming and Bowden, 2009).

A cross-sectional web-based survey method was selected as appropriate for this investigation. The decision to use this method was based on several factors which are indicative of the characteristic elements of survey research: 1) the population base is large and lends itself nicely to probability sampling procedures (general public: 1,582,264 people; broadcast media: 35 television stations and 250 radio stations; 95 county emergency managers); 2) surveys allow for systematic procedures to be developed in asking questions of respondents and recording their answers; and 3) this approach lends itself well to codification of answers and the subsequent mixed methods approach (quantitative and qualitative) to analyse the data collected.

A cross-sectional survey design was used to establish the variations between years for the public surveys and between public, broadcast media and emergency management surveys. This allowed examination of the relationship between different variables and look for patterns and/or gaps in the warning system (Bryman, 2008a).

Telephone surveys were considered for this project. Today, telephone modality remains in place for conducting many surveys; however increased use of cellular technology for personal and business communications has both increased the challenges faced by researchers, while helping to alleviate some of the corresponding research issues associated with telephone surveys. Kempf and Remington, (2007) found that the evolution of telephone survey research has improved due to technologies associates with computer-assisted telephone interviewing (CATI), interactive voice response and call schedulers. However, increased technological advances have also complicated things. Greater emphasis on personal privacy, convenience, and relief from telemarketers by potential respondents has produced a communications screening system requiring researchers to resolve issues revolving around technological mechanisms created by caller ID, answering machines, and number portability.

Telephone coverage remains an issue for all researchers using this mode of data collection. The advent of cellular technology has caused shifts in household population frames over the past years and as a result there have been distinct losses and gains in populations using traditional landline telephones verses those changing to using wireless telephones. Due to the cost, along with the time restraint for respondents, this method was not used.

3.2.2 Phenomenological Qualitative Focus Group

In order to evaluate human behaviour and participant experiences and to gather the thoughts and beliefs of focus group participants, the phenomenological research method was used during qualitative focus groups. Individuals were able to share their knowledge/experience of disasters, level of preparedness, communication strategy and perceived risk associated with severe weather and emergency preparedness (Bryman, 2008c).

This study's mixed methods design focuses on multiple areas of concentration, measuring behaviour patterns and the relevant knowledge elements related to severe weather warning systems, and enables multilevel analysis (Bryman, 2008d).

3.3 Instruments Used

3.3.1 SPSS

Statistical Package for the Social Sciences (SPSS) was used to analyse the quantitative data collected with the Cross-Sectional Web-based Surveys. It was used to describe data, test the hypotheses and examine relationships. This was done by coding the data into SPSS and creating descriptive statistics in the form of tables including means and percentages. Tables were used to describe data and interpret basic statistics correctly (Byrman, 2008b).

Inferential statistics in the form of chi-square tests were used to test association between categorical variables. Where statistically significant results were obtained, standardized residuals were used to determine which categories were contributors to achieving a significant result.

3.3.2 Atlas ti

Atlas ti helps uncover and systematically analyse phenomena hidden in text and multimedia data. The coding framework was used to locate, code, and annotate findings in the 6 focus groups that were conducted. This method allowed for consolidating large volumes of transcripts which outlined a way to keep track of notes, annotations, codes and memos for each of the focus groups.

3.4 Conclusion

Selecting the appropriate methodology for collecting data offers numerous choices and provides many challenges for researchers. This study used the electronic survey method and phenomenological qualitative focus groups to gather the data necessary for this thesis. Modern quantitative and qualitative software programs were used to analyse the data collected. With proper design, effective formatting and proper attention to issues such as ethnicity, privacy and confidentiality, data quality, this study effectively and scientifically used the tools available to create sound academic research.

Chapter 4 - Methods Section

4.1 Introduction

This chapter will explain the steps followed in order to answer the research questions. It will also describe what method was used and explain how the results were analysed. This section will also describe the process used in the study, explain how the materials were prepared, explain how measurements were made and state the test used to analyse the data.

4.2 Research Design

The table 4.1 below illustrates the process that was followed to complete this project.

Table 4.1 – Describes the research design

Type	Date Completed
Public Survey (2007)	August 29, 2007
Public Survey (2008)	August 15, 2008
Public Survey (2010)	December 2, 2010
Broadcast Media Survey (2010)	January 14, 2011
Emergency Management Survey (2010)	January 31, 2011
Public Focus Group (low income)	June 20, 2011
Public Focus Group (public at large)	July 20, 2011
Public Focus Group (Hispanic/non-English Speaking)	August 25, 2011
Broadcast Media Focus Group	May 27, 2011
Emergency Management Focus Group	June 22, 2011
Meteorology Focus Group	July 26, 2011

Table 4.1 list the types of instruments used and the date the instrument was deployed. The electronic surveys were posted on the internet for respondents to reply to. The Nashville Office of Emergency Management sent out reminders

utilizing numerous mailing lists on hand used to communicate with the public. The Tennessee Association of Broadcasters sent out reminders to the broadcast media and the Tennessee Emergency Management Agency sent out reminders to the county emergency managers.

The focus group script was developed. The Tennessee Association of Broadcasters and the Tennessee Emergency Management Agency assisted with getting the word out to potential focus group participants.

4.3 Population

4.3.1 Cross-Sectional Web-based Survey

Several web-based surveys were conducted. This section describes the electronic surveys that were conducted with the general public, broadcast media and emergency management.

4.3.1.1 Study Setting for the General Public Surveys

For this study, the Nashville Metropolitan Statistical Area (MSA) (2010) was used as the study population (Table 4.2). The table delineates the Nashville MSA has a total population of 1,518,971. This study only included individuals that were eighteen years of age or older, thus 1,143,159 were defined as the potential target audience. The table below delineates the target audience for this part of the study.

Table 4.2 – Population of the Nashville Metropolitan Statistical Area

	Male	Female	Total
Total	**555,360**	**587,799**	**1,143,159**
18 and 19 years	20,856	19,218	40,074
20 years	11,287	10,733	22,020
21 years	11,274	9,395	20,669
22 to 24 years	27,191	29,101	56,292
25 to 29 years	56,025	55,125	111,150
30 to 34 years	53,558	53,472	107,030
35 to 39 years	58,472	57,745	116,217
40 to 44 years	58,911	59,676	118,587
45 to 49 years	58,101	60,620	118,721
50 to 54 years	53,105	55,247	108,352
55 to 59 years	44,516	48,666	93,182
60 and 61 years	16,405	16,113	32,518
62 to 64 years	19,111	20,323	39,434
65 and 66 years	10,754	10,842	21,596
67 to 69 years	12,956	15,042	27,998
70 to 74 years	17,070	21,584	38,654
75 to 79 years	12,842	17,238	30,080
80 to 84 years	7,687	14,288	21,975
85 years and over	5,239	13,371	18,610

Source: US Census 2006-2008 estimate, American Community Survey. Government document in the public domain from www.census.gov

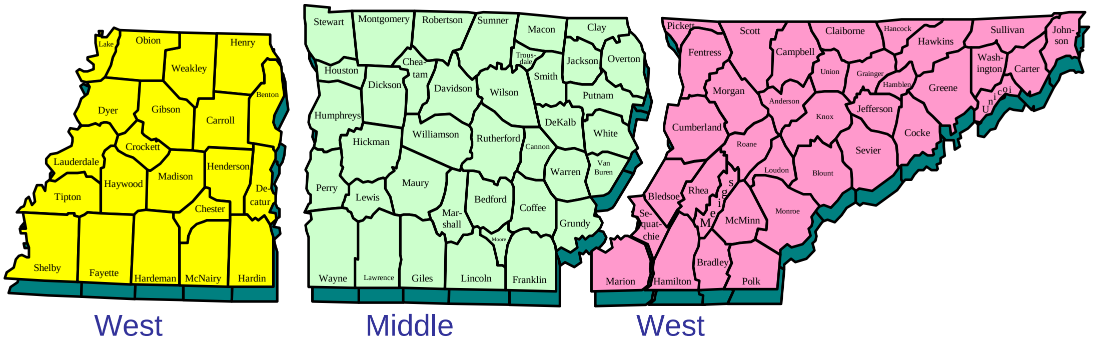
4.3.1.2 Study Setting for the Broadcast Media Surveys

Since 1948, the Tennessee Association of Broadcasters (TAB) has been a 501c (6) corporation and the voice of the federally licensed, free-over-the-air radio and television stations and associated industries in Tennessee. The TAB represents approximately 250 members annually (25 television stations, 200 radio stations and 25 affiliates).

4.3.1.3 Study Setting for the Emergency Management Surveys

There are 95 counties within the state of Tennessee. Each of the counties has an emergency manager that assists in coordinating prevention, preparedness, response, recovery and mitigation activities. This agency acts as the coordination point for response agencies for additional resources that may be needed in planning for or responding to a community in need. Figure 4.2 shows a map outlining the three Tennessee Emergency Management Agency (TEMA) regions and the counties in each region (www.tnema.gov).

Figure 4.1 – TEMA Regions



4.3.2 Phenomenological Qualitative Focus Groups

Several focus groups were recruited, encompassing the general public (underserved, public-at-large and non-English speaking), broadcast media, meteorology and emergency management.

4.3.2.1 General Public Focus Group 1

The general public focus group 1 was conducted at the Parthenon Towers apartment complex. This complex of 295 residents was developed to house the underserved (low-income government housing and senior living) population of the Nashville area. This focus group represented the underserved population in the Nashville Metropolitan Statistical Area. The participants within the focus group were living in government housing, were low-income and seniors. Focus group participants ranged in age from 42 to 73 years of age, both male and female in gender.

4.3.2.2 General Public Focus Group 2

General public focus group 2 was conducted at the First Unitarian Universalist Church in Nashville. This focus group represented the general population of the Nashville Metropolitan Statistical Area. The participants in this focus group ranged in age from 25 to 64 and were both male and female.

4.3.2.3 General Public Focus Group 3

The Nashville Area Hispanic Chamber of Commerce assisted with setting up, recruiting and translation of the general public focus group 3. Focus group 3 consisted of Hispanic/non-English speaking participants ranging in age from 21 to 65. The focus group volunteers were eager to participate giving the rare opportunity to voice their past and present experiences regarding severe weather alerts/warnings. The focus group participants range from individuals with limited education to college graduates; legal and illegal; age range from 21 to 65; and both male and female.

4.3.2.4 Broadcast Media Focus Group 4

The Tennessee Association of Broadcasters (TAB) assisted with the coordination of the broadcast media focus group. TAB sent out an email to its membership asking for volunteers to participate in a broadcast media focus group. This focus group represented broadcast radio and broadcast television throughout the state of Tennessee.

4.3.2.5 Meteorology Focus Group 5

The National Weather Service (NWS) assisted with conducting the meteorology focus group. NWS assisted with recruiting meteorologists to participate in this focus group, contacting each of the television stations via email asking them to participate. This focus group represented both broadcast meteorologists and National Weather Service meteorologists.

4.3.2.6 Emergency Management Focus Group 6

The Tennessee Emergency Management Agency (TEMA) assisted with coordinating the emergency management focus group. TEMA recruited participants for this focus group by county emergency management directors within the Nashville Metropolitan Statistical Area (MSA) and representatives from TEMA to participate.

4.4 Procedures

This section describes the steps taken by the researched to conduct the electronic surveys.

4.4.1 Cross-Sectional Web-based Survey

Cross-sectional web-based surveys allow researchers to obtain data about an identified sector of the population.

4.4.1.1 General Public Surveys

Subjects were obtained through voluntary means. The voluntary nature of the sample of course leads to potential bias, as subjects that are more likely to hear about the survey, or those that feel most strongly about the topic, may be more inclined to respond (Dillman et al., 2009). The public surveys were distributed using the Nashville Office of Emergency Management website. The Nashville Office of Emergency Management sent out reminders through numerous mailing lists to communicate with the public. However, it is believed that the sample obtained here is suitably representative to give meaningful results. Certain types of subjects may not have been included in the sample and this will be noted within the limitations of the study and results will be interpreted with this in mind.

To survey the general public, the Nashville Office of Emergency Management posted electronic surveys on their website during 2007 (July 26, 2007 – August 29, 2007), 2008 (July 1, 2008 – August 15, 2008) and 2010 (September 21, 2010 – December 2, 2010), via the website (www.nashville.gov/oem/) to the Nashville Metropolitan Statistical Area (MSA). Weekly reminders were emailed by the Nashville Office of Emergency Management, making people aware of the public survey. The 2009 survey data will not be used in this project due to the equipment failure during the data collection period of the survey.

4.4.1.2 Broadcast Media Surveys

The Tennessee Association of Broadcasters (TAB) assisted with the distribution of the survey throughout the state of Tennessee to all television and radio stations. There are 35 broadcast television stations and 250 broadcast radio stations within the state of Tennessee. In 2010 (December 1, 2010 – January 14, 2011; 45 days), the broadcast media survey was posted on the Tennessee Association of Broadcasters website (www.tabtn.org/). TAB sent out weekly reminders about the importance of broadcaster participation.

4.4.1.3 Emergency Management Surveys

The Tennessee Emergency Management Agency (TEMA) assisted with the development, validation and distribution of the emergency management survey. In 2011 (December 16, 2010 – January 31, 2011; 45 days), the emergency management survey was posted on the Tennessee Emergency Management Agency (TEMA) website (www.tnema.org/) and notifications were sent to the 95 county emergency managers. Weekly reminders were sent out to the county emergency managers about the survey availability.

4.4.2 Phenomenological Qualitative Focus Group

In order to provide comparative data with the findings derived from the survey results, six focus groups were conducted to gather additional qualitative data to further analyse community preparedness levels and agency/organizations' working relationships (Morgan, 1997).

Focus group participants were obtained using a convenience sampling method. The voluntary nature of the sample leads to potential bias, as subjects that are more likely to hear about the survey or those that feel most strongly about the topic may be more inclined to respond. However, the sample obtained was suitably representative to give meaningful results based on the number of surveys conducted and size of each sample. The pubic focus groups represented the population at large, the underserved population (low income, assisted living, special needs) and the non-English speaking population (Hispanic community). The broadcast media group represented local radio and television stations. The meteorology focus group represented all television stations in the Nashville market along with meteorologist from the National Weather Service. The emergency management focus group represented county and state emergency managers.

4.4.2.1 General Public Focus Groups

In coordinating the general public focus groups, a meeting was conducted with key community leaders, church leaders and chamber of commerce leaders regarding this PhD project. Each of these groups of stakeholders assisted in coordinating and assigning the locations of each of the public focus groups that was held. Invitations and information regarding the focus group was sent out to prospective participants. The information was also made available in hard copy for the underserved and non-English speaking communities. Email reminders were sent out to the public at large about the date and time of each of the focus groups. Thank-you notes were emailed to each of the general public focus group participants.

Public focus group # 1 (low-income/government housing) was conducted on June 20, 2011. Public focus group # 2 (public at large) was conducted on July 20, 2011. Public focus group # 3 was conducted on August 25, 2011.

4.4.2.2 Broadcast Media Focus Group

The broadcast media focus group consisted of representatives from broadcast radio stations and broadcast television stations across the state of Tennessee. The broadcast media focus group was coordinated by the Tennessee Association of Broadcasters (TAB). Thank-you notes were emailed to each of the broadcast media focus group participants.

The broadcast media focus group was conducted on May 27, 2011.

4.4.2.3 Meteorology Focus Group

The meteorology focus group consisted of local television meteorologists representing the 4 television stations in the Nashville market as well as NWS meteorologists. The National Weather Service invited television meteorologists from the Nashville area to participate in the meteorology focus group. Thank-you notes were emailed to each of the meteorology focus group participants.

The meteorology focus group was conducted on July 26, 2011.

4.4.2.4 Emergency Management Focus Group

The emergency management focus group consisted of emergency managers representing small and medium counties as well as metropolitan communities. The Tennessee Emergency Management Agency (TEMA) assisted with site logistics in preparation for the emergency management focus group. Thank-you notes were emailed to each of the emergency management focus group participants.

The emergency management focus group was conducted on June 22, 2011.

4.5 Tools

This section describes the research tools used during this study.

4.5.1 Cross-Sectional Web-based Survey

The surveys used in the research were derived from the Public Readiness Index (PRI). PRI is a widely used and validated survey (PRI, 2012). PRI was initially created by a partnership between the American Red Cross, the Council for Excellence in Government, the George Washington University Homeland Security Policy Institute and the U.S. Department of Homeland Security. The initial survey consisted of simple questions on the Readiness Quotient (RQ) test that were found through rigorous testing and validation to be the most predictive of an individual's preparedness for a weather emergency, natural disaster or terrorist attack.

After many months of consultation, testing, evaluation and analysis, the PRI Survey Instrument was validated and approved for distribution. The group worked with first responders, academics and subject matter experts from emergency management and preparedness communities. Tests were conducted by telephone and participants were selected from three major cities (New York, Miami and Chicago) through random digital dialling (RDD).

4.5.1.1 General Public Surveys

In 2007, the survey was developed in conjunction with the Nashville Office of Emergency Management by modifying the existing PRI survey to have it distributed via their website. (See Appendix B, C, D, and E). This enhanced public survey was divided into the following areas: emergency situations, evacuation, knowledge of government actions, personal preparedness, employment, schools and demographics. The survey was modified in 2008 and 2010 based on data from the 2007 survey and gaps identified. The 2009 results are not presented due to a computer system error at the Nashville Office of Emergency Management. Subject matter experts from the Nashville Office of Emergency Management along with others met each year to review and validate the survey before it was distributed. Each of the surveys was sent annually to the University of Glamorgan PhD committee for approval. Once approved, the surveys were prepared for posting on the web at www.nashvillegov/oem/.

4.5.1.2 Broadcast Media Survey

In developing the broadcast media survey, the questions were divided into the following categories: station demographics, station operational protocols, severe weather emergencies, knowledge of the National Weather Service (NWS), knowledge of the Emergency Alert System (EAS) and level of preparedness. Some of the same questions from the public survey in the following areas: demographics, severe weather emergencies and level of preparedness.

Questions related to severe weather and broadcast media (radio and television) in the following areas were added: station operational protocols, severe weather emergencies, knowledge of the National Weather Service (NWS) and knowledge of the Emergency Alert System (EAS) (See Appendix F). Representatives from the Tennessee Association of Broadcasters along with representatives of broadcast organizations assisted with the question validation process using face validity. This allowed the evaluation of each question to meet the criterion for the study. Upon completion of this process, questions were sent to the University of Glamorgan PhD committee for approval. Once approved, questions were put into survey format.

4.5.1.3 Emergency Management Survey

In developing the emergency management survey, some of the same questions from the public survey (demographics, severe weather emergencies and level of preparedness) and the broadcast media survey, along with specific topics related to severe weather and emergency management (operational protocols, knowledge of the National Weather Service (NWS) and knowledge of the Emergency Alert System (EAS). (See Appendix G). The Tennessee Emergency Management Agency in conjunction with county emergency managers assisted with the validation process. The questions were validated by emergency managers using face validity. The evaluation of each question was analysed in order to meet the criterion for the study. Upon the completion of this process, the questions were sent to the University of Glamorgan PhD committee for approval. Once the questions were approved, questions were put into survey format.

4.5.2 Phenomenological Qualitative Focus Group

Focus groups were used to collect qualitative data. Volunteers were invited to participate in a group discussion related to “Emergency Warning Systems: Factors Influencing Citizen Decision Making.” Open-ended questions were asked to each of the focus group participants, allowing them to express themselves in an honest and open manner.

The focus group discussions started with a written set of questions developed from data gained from the three surveys, as well as additional information gained from after-action reports from previous disasters in the area and from newly published literature.

Additional questions were inserted based on the focus area of the group: emergency management, broadcast media, meteorology and non-English speaking population. (See attached sample questions.) The focus group questions were reviewed and validated by subject matter experts. These experts were identified by the professional associations and government agencies. Meetings were convened and feedback was gathered from each of the groups related to the questions. A script was designed for each of the focus groups.

The focus group allowed participants the opportunity to comment on ideas shared by others, which enabled important and significant topics to be discussed openly among focus group participants (Bryman, 2008c). For this research study, six focus groups were conducted with the researcher serving as the group moderator.

4.6 Procedures

4.6.1 Cross-Sectional Web-based Survey

This section outlines the survey administration of the web-based surveys.

4.6.1.1 General Public Survey Administration

In order to give maximum opportunities for all population groups to be represented, for example, each of the three public surveys was available for 45 days on the Nashville Office of Emergency Management Website (www.nashville.gov/oem/). The web-based public survey was made available in various formats (e.g. website, hard copy and voting machine). Individuals who had access to a computer with internet availability could voluntarily fill out the general public questionnaire online or the questionnaire could be downloaded. Printed copies could be completed and either mailed or faxed directly to the Metropolitan Nashville Office of Emergency Management (OEM). During a community event that was held during the time the survey was open, OEM placed a voting machine at the event to allow the community better access to the survey. These surveys were completely voluntary and there was no specific group of Nashville MSA citizens being asked to take part in the survey. With all of the methods used to collect public data, reasonable efforts were made to ensure that the sample was as representative of the population as possible.

4.6.1.2 Broadcast Media Survey Administration

In order to complete the broadcast media survey, participants went to the Tennessee Association of Broadcasters website (www.tabtn.org). Each of the survey participants completed the survey in Survey Monkey, a software package designed to assist with quantitative surveys. If any of the survey participants had questions, they were given a point of contact to express concerns or ask questions. The broadcast media survey was made on the Tennessee Association of Broadcasters website for 45 days.

4.6.1.3 Emergency Management Survey Administration

The Tennessee Emergency Management Agency (TEMA) emailed their regional directors along with the ninety-five county directors a link to Survey Monkey as well as the password to access and completes the survey online. If any of the survey participants had questions, they were given a point of contact to express concerns or ask questions. The Emergency Management survey was made available through a web-link posted on the Tennessee Emergency Management Agency website for 45 days.

4.6.2 Phenomenological Qualitative Focus Group

Focus groups were conducted under the supervision of an independent adjudicator. A thorough review of questions used in the quantitative phase of this project was conducted prior to administration by subject matter experts in each field. A list of open-ended questions was derived from the quantitative survey and additional questions were added based on some of the findings of the quantitative survey. (See Appendix H, J, K, L, M, N and O). Once the list of questions was validated by a group of subject matter experts in the field of disaster preparedness, the questions were then emailed to the University of Glamorgan PhD Committee for review, comments and approval. A script was developed and used for each of the focus groups.

4.6.2.1 Implementation

The focus group process was explained to the group participants at the initial meeting, beginning with a general introduction and each participant introducing himself. The group was then informed as to the purpose of the research.

At the onset of each session, participants were thanked for their participation in the focus group and a forum for questions or concerns began. Included in the information and instructions to each group was the confidentiality of all information recorded and all data collected (all information would be recorded). Consent forms were then given to each participant. Consent forms were completed and signed by all focus group participants. Participants were given the option to withdraw from the group at any time. However, no one took this option.

Each participant was given instructions on the manner in which the focus groups would be conducted. When a question was posed to the participants, they were encouraged to raise their hands to be recognized, then to state their first name. All participants were given the opportunity to respond to the question, and the next question was then asked. After all the questions were asked, a general discussion among participants was allowed with no new information shared, the focus group was closed.

4.7 Data Collection

4.7.1 Quantitative Data Collection

Data collection incorporated a multi-levelled approach using an appropriate sampling method. Data reflected the variables considered in deciding the size and accessibility of target populations; identification of sampling errors or biases; and critique of the sampling procedure. The data collection process also incorporated a detailed time frame for gathering and studying the sample.

Email communications were sent out by all three organizations, making individuals aware of the importance and purpose of each of the surveys. Periodic reminders were sent out during the 45-day period that each of the surveys remained open.

Data were collected from the three different web-based surveys using Survey Monkey. Once the initial data was obtained, a comprehensive analysis was conducted tying the results of the three surveys (public, broadcast media and emergency management) together. The surveys had commonalities that were compared and analysed looking for trends and statistical differences.

4.7.1.1 General Public Surveys

Upon completion of the 45-day period, a thorough review and analysis as described in Results Section (Chapter 5) was conducted to determine the impact that knowledge / experience, level of preparedness, perceived risk and communication strategies had on the community's decision making process.

4.7.1.2 Broadcast Media Survey

The web-based broadcast media survey was only made available to members of the Tennessee Association of Broadcasters (TAB). The survey was posted on the TAB website for 45 days. TAB sent out reminders about the opening and closing dates of the surveys. Data was collected using a survey software package (Survey Monkey).

4.7.1.3 Emergency Management Survey

The web-based emergency management survey was only made available to members of the county emergency management agency. TEMA sent out reminders about the opening and closing dates of the surveys. Data was collected using a survey software package (Survey Monkey).

4.7.2 Phenomenological Qualitative Focus Group –

Each of the focus group participants signed in on a log and completed an informed consent document. (See Appendix I) Each focus group participant was given a copy of the informed consent document for their files.

A script was developed and used for each of the focus groups. All of the focus groups were recorded and transcribed, then analysed with Atlas.ti software. All of the transcriptions are included in the appendices of this thesis.

One of the disadvantages of focus groups is that some people are uncomfortable about expressing their views in front of their peers (Barbour, 2007). The participants were given considerable liberty in expressing their opinions about the situations presented to them, as well as their observations and experiences in dealing with disasters. From the focus groups, information was obtained about personal reactions, specific emotions and individual knowledge of disaster preparedness. The combined quantitative and qualitative data will enhance and supplement the study. The data from the focus groups was used to validate the conclusions made from the survey data. The survey data was collected first and then the focus groups were conducted (sequential).

4.8 Data Analysis

This section will explain the process followed during the data analysis process.

4.8.1 Quantitative Data Analysis

This section will explain the details of the quantitative data analysis of the electronic web-based survey data.

4.8.1.1 Data Cleaning

The data collected was entered and then exported from the electronic survey software into an Excel spread sheet. The data was then reviewed for consistency and accuracy. In order to increase the accuracy of the data, the incomplete survey participant information and partially completed surveys were also purged from the data set and were not used in the analysis. This allowed for a more complete data set to be analysed.

4.8.1.2 Data Coding

Data was imported into SPSS for quantitative analysis. Each of the variables was assigned a numeric value. This process converted the narrative data into a numeric form. For example: 0 = no and 1 = yes.

4.8.1.3 Data Analysis

Data was collected utilizing electronic surveys to answer the following research questions. Frequency tables and contingency tables were used to explain the findings.

1. What are the knowledge / experience levels of a given population of the tornado warning system?
2. What is the level of preparedness within a given population?
3. What is the perceived risk within a given population?
4. How effective is the existing emergency alert / notification communication strategy?
5. What is the relationship between the knowledge / experience of the severe weather warning system and the levels of preparedness?

Key variables from the electronic surveys were identified in the areas of knowledge and experience level, level of preparedness, perceived risk and communication strategies. The quantitative analysis was conducted using correlations to describe and synthesize the quantitative data which was collected from the electronic surveys then coded. Frequency distribution was illustrated using frequency tables. The number of responses for each variable was evaluated each year. The difference between years was examined using the T-Test. Contingency tables were used to review the multivariate frequency distribution of the key variables. The relationships between two variables were reviewed.

The study tested the association between key variables as well as the demographic data collected from the electronic surveys to address the complex interaction of psychological, social, cultural, economic and physical factors. The demographic data was cross-tabulated using the chi-square test of independence with key variables relating to knowledge/experience, level of preparedness, perceived risk and communication strategies. The chi-square test of independence was used to define the level of statistical significance in the relationship of the different variables. This test calculated the difference between the actual and the expected value for each table to express the level of significance (Bryman, 2008b). Standardised residuals have been calculated to determine which cells within the table are over-or under-represented in instances in which significant results have been achieved. The significant cell values are greater than 1.96 ($p<0.05$) or 2.58 ($p<0.01$).

A coding system has been established for consistent data scoring throughout the electronic surveys, as well as a process to verify and spot check the accuracy of the data.

4.8.2 Data Analysis - Qualitative

This section will explain the details of the qualitative data analysis of the focus groups.

4.8.2.1 Data Cleaning

The transcripts were reviewed while listening to the tapes to make sure the transcriptionist captured the correct data. The data was then reviewed for consistency and accuracy. This allowed findings to be examined and analysed from a more complete data set.

4.8.2.2 Data Coding

Data was imported into Altas ti for qualitative analysis. Each of the 6 six focus groups was coded with a focus on: knowledge/experience, level of preparedness, perceived risk and communication strategies. Codes were established for each of these focus areas. (See Appendix P)

4.8.2.3 Data Analysis

The data collected from the focus groups was used to answer the following research questions:

1. What are the knowledge/experience levels of a given population of the tornado warning system?
2. What is the level of preparedness within a given population?
3. What is the perceived risk within a given population?

4. How effective is the existing emergency alert/notification communication strategy?

For the qualitative analysis, the phenomenological theory was used for this study to gain a deeper understanding of the participants' experience and expertise in the areas of: knowledge/experience, level of preparedness, perceived risk and communication strategies and their relationship to the psychological, social, cultural, economic and physical factors of the target audience. A content analysis was used to review and analyse the real-world experiences of the focus group participants. The phenomenological theory was used to examine the findings from the focus group participants' observation and knowledge of disasters (Polit & Beck, 2008).

Each of the focus groups was transcribed and analysed through a series of coding procedures and then evaluated using Atlas.ti. Atlas.ti is an analytical qualitative tool used to systematically analyse and consolidate large bodies of text. The transcriptions have been analytically coded as described by Emerson et al., (1995). This two-phase process included open and focused coding. In open coding, the transcriptions were read line-by-line to identify and form any and all ideas, themes, or issues they suggest, no matter how varied and disparate they are. In the proceeding focused coding phase, the transcriptions were analysed more closely on the basis of topics that had been identified as being of particular interest. This procedure led to the formation of the major themes and topics of the project.

From the literature and previous research on this topic, several broad themes have been identified including participants' knowledge about warning systems, their perceived level of preparedness and their opinions about the effectiveness of the current warning systems. The transcriptions are coded for these themes, along with others, to identify patterns among the responses. Once a number of more specific themes are identified, the transcriptions are coded and organized again. It is expected that patterns will emerge among the different focus groups and those patterns will also be analysed.

Once the six focus groups were completed, the data collected was entered into Atlas ti. Upon completion, the data was triangulated to determine the relationships between the quantitative and qualitative analysis.

4.9 Ethical Considerations

Ethics is an important factor of any research study involving human subjects. The ethical standards established for this research study include privacy, confidentiality and informed consent.

Each of the cross-sectional surveys was completed on a voluntary basis. There were no specific groups or individual citizens that were asked to complete the surveys. The web-based public survey was open to everyone that accessed the Nashville Office of Emergency Preparedness website during the survey period. Reminders about the public survey and the opening and closing dates were sent out via email, public announcement and word of mouth. The Broadcast Media Survey was available to all Tennessee Association of Broadcasters (TAB) members and the Emergency Management Survey was available through the Tennessee Emergency Management Agency (TEMA). The survey results from each of the studies conducted were number coded and names were removed so the survey results were kept anonymous.

A description of the project was given to participant in each of the qualitative focus groups with an explanation stating that each participant had the right to withdraw from this project at any time. All focus group participants signed an informed consent document with no one withdrawing from the group.

Participants were informed that this research study would be to evaluate the existing emergency warning system capabilities and capacities in notifying the general public of severe weather in a timelier manner.

After all transcriptions were complete, the names of the participants were removed and replaced by initials. All focus group participants remain anonymous.

4.10 Governance Arrangement

4.10.1 Permissions

4.10.1.1 Ethical approval was obtained from the University of Glamorgan.

4.10.1.2 Consent forms were signed by every focus group participant.

4.10.2 Storage of Data

Data is being stored on a safe and secure hard drive that has back-up data storage capability.

4.10.3 Research Practice

This study has investigated the hypothesis that there is a relationship between individual knowledge/experience and the level of personal preparedness within the state of Tennessee. Quantitative and qualitative data was collected and analysed to test this hypothesis. The findings will be reviewed in the discussion and new knowledge sections. Confidentiality of the respondents was maintained throughout the entire project.

This research project was conducted under the supervision of the chairperson from the University of Glamorgan. Sound research methods and techniques were used throughout the entire process.

4.11 Conclusion

Selecting the appropriate methodology from numerous choices for collecting data provides many challenges for researchers. This chapter reviewed the methods used in this study and the following chapters will present the findings of the quantitative and qualitative research.

Chapter 5 – Results Section – Quantitative Analysis

Quantitative Analysis

Quantitative results of public, broadcast media and emergency management surveys were reviewed in this section. Sample characteristics were presented using descriptive statistics, whilst inferential statistics were used to study the course of change during the three years of the study of the public survey data. Chi square tests have been used to detect an overall effect and where significant results have been achieved, standardised residuals have been calculated in order to determine which cells within the table are over-or under-represented.

5.1 Sample Characteristics of the General Public Surveys

Included in this section is an explanation of the size and nature of each of the respondent characteristics during the years of the surveys (2007, 2008 and 2010) in terms of variables such as employment status, number of people currently living in the household, age, gender, annual income and highest education grade completed.

5.1.1 Cross-Section Web-based General Public Surveys

The total number of respondents in the three years (2007, 2008 and 2010) of this research project was 5,794. The tables reflected the valid total for each question at the times of the responses. The valid total (the total frequency of actual responses excluding missing pieces of data or errors) included 2,254 respondents in 2007, 2,161 respondents in 2008 and 1,379 respondents in 2010.

Table 5.1 shows that a majority of the respondents to the public survey were employed full-time throughout the study. The number of those respondents who were employed full-time increased from 91.3% in 2007 to 94.0% in 2008. There was a significant change in the number of ‘unemployed’ over the three years of the study (χ^2 =17, df =6, p=0.009). The proportion of ‘unemployed’ fluctuated over time. Standardised residuals indicate that in 2007 there were significantly more (p<0.01) than expected at 3.3% (73) and that in 2008 there were significantly fewer (p<0.05) than expected at 1.8% (38).

Table 5.1 Public survey respondents’ employment status

Demographics (Public)(Q26)	2007 *n*=2,207 *n* (%)	2008 *n*=2,138 *n* (%)	2010 *n*=1,375 *n* (%)	Total *n*=5,720 *n* (%)	*p*- value
Unemployed	73 (3.3)	38 (1.8)	28 (2.0)	139 (2.4)	0.009 *
Self Employed	53 (2.4)	44 (2.1)	24 (1.7)	121 (2.1)	
Employed Part Time	65 (2.9)	46 (2.2)	36 (2.6)	147 (2.6)	
Employed Full Time	2,016 (91.3)	2,010 (94.0)	1,287 (93.6)	5,313 (92.9)	

Note: 74 (1.3%) missing,* Statistically Significant

The highest proportions of respondents reported two people currently living in the household. The percentages of people living two to a household changed very little during the three years of this study. During the study period 25.1% of the respondents had four or more individuals living in the household.

Table 5.2 Number of people within the household, including the respondent, at the time the questionnaire was completed

Demographic (Public)(Q28)	2007 *n*=2,166 *n* (%)	2008 *n*=2,102 *n* (%)	2010 *n*=1,325 *n* (%)	Total *n*= 5,593 *n* (%)	*p*-value
1	337 (15.6)	349 (16.6)	212 (16.0)	898 (16.1)	0.831
2	811 (37.4)	788 (37.5)	513 (38.7)	2,112 (37.8)	
3	465 (21.5)	429 (20.4)	283 (21.4)	1,177 (21.0)	
4 or more	553 (25.5)	536 (25.5)	317 (23.9)	1,406 (25.1)	

Note: 201 (3.5%) missing

There was a significant change over time in the age of the public survey respondents (χ^2 =31, df=10, p=0.001). Table 5.3 shows that a low response rate occurred in both the lower age group (18-24) and the higher age group (65+). The majority of the survey respondents varied in age between 35 and 64, with the age band having the highest response being 45-54 years of age. The proportion of respondents aged 55 to 64 years increased over time. Standardised residuals indicate that in 2007 there were significantly fewer (p<0.05) than expected at 20.9% (454) and that in 2010 there were significantly more (p<0.05) than expected at 27% (360).

Table 5.3 Age of the public survey respondents

Demographics (Public) (Q30)	2007 *n*=2,171 *n* (%)	2008 *n*=2,104 *n* (%)	2010 *n*=1,333 *n* (%)	Total *n*=5,608 *n* (%)	*p*- value
18 - 24	51 (2.3)	31 (1.5)	20 (1.5)	102 (1.8)	0.001 *
25 - 34	389 (17.9)	358 (17.0)	200 (15.0)	947 (16.9)	
35 - 44	571 (26.3)	524 (24.9)	299 (22.4)	1,394 (24.9)	
45 - 54	633 (29.2)	648 (30.8)	407 (30.5)	1,688 (30.1)	
55 – 64	454 (20.9)	485 (23.1)	360 (27.0)	1,299 (23.2)	
65 +	73 (3.4)	58 (2.8)	47 (3.5)	178 (3.2)	

Note: 186 (3.2%) missing, * Statistically Significant

Table 5.4 shows that in each of the three years (2007, 2008 and 2010) there were consistently higher responses from females than males, with 59.6% (3,269) of the responses from female participants. There was a significant change over time in the number of male respondents to the public survey (χ^2 =14, df=2, p=0.001). The proportion of male respondents to the public survey decreased over time, with significantly more than expected in 2007 (p<0.05) and significantly fewer than expected in 2010 (p<0.05).

Table 5.4 Public survey respondents' gender

Demographics (Public)(Q31)	2007 *n*=2,117 *n* (%)	2008 *n*=2,047 *n* (%)	2010 *n*=1,323 *n* (%)	Total *n*=5,487 *n* (%)	*p*- value
Female	1,199 (56.6)	1,238 (60.5)	832 (62.9)	3,269 (59.6)	0.001 *
Male	918 (43.4)	809 (39.5)	491 (37.1)	2,218 (40.4)	

Note: 307 (5.5%) missing, * Statistically Significant

Although the majority of female respondents in Table 5.5 were employed full-time, there was a significant change during the duration of this study in the employment status of the female respondents (χ^2 =79, df=6, p<0.001). The proportion of self-employed females decreased over time, with significantly more than expected in 2008 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). With reference to employment status of the male respondents, there was also a significant change as this study progressed (χ^2 =120, df=6, p<0.001). The proportion of unemployed males decreased over time, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). The proportion of self-employed males fluctuated over time, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.01). The proportion of part-time employed males fluctuated over time, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.01). The proportion of full-time employed males fluctuated over time, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2008 (p<0.05).

Table 5.5 Employment status and gender of the public survey respondents

Demographics (Public)(Q26F)	2007 *n*=2,117 *n* (%)	2008 *n*=2,035 *n* (%)	2010 *n*=1,320 *n* (%)	Total *n*=5,472 *n* (%)	*p*- value
Female					
Employed Full Time	1,199 (100.0)	1,152 (93.7)	781 (94.1)	3,132 (96.1)	< 0.001 *
Employed Part Time	0 (0.0)	33 (2.7)	23 (2.8)	56 (1.7)	
Self Employed	0 (0.0)	29 (2.4)	13 (1.6)	42 (1.3)	
Unemployed	0 (0.0)	15 (1.2)	13 (1.6)	28 (0.9)	
Male					
Employed Full Time	727 (79.2)	764 (94.8)	459 (93.7)	1,950 (88.1)	< 0.001 *
Employed Part Time	65 (7.1)	10 (1.2)	11 (2.2)	86 (3.9)	
Self Employed	53 (5.8)	11 (1.4)	9 (1.8)	73 (3.3)	
Unemployed	73 (8.0)	21 (2.6)	11 (2.2)	105 (4.7)	

Note: 302 (5.6%), * Statistically Significant

During the three years of the study, Table 5.6 shows there was very little change in income between genders. The majority of the survey respondents, both female and male, earned $50,000 or higher annually.

Table 5.6 Household income and gender of public survey respondents

Demographics (Public)(Q33A)	2008 *n*=1,675 *n* (%)	2008 *n*=1,067 *n* (%)	Total *n*=2,742 *n* (%)	*p*- value
Female				
Less than $15,000	5 (0.5)	1 (0.2)	6 (0.4)	0.471
$15,000 - $24,999	26 (2.6)	15 (2.3)	41 (2.5)	
$25,000 - $34,999	91 (9.1)	50 (7.6)	141 (8.5)	
$35,000 - $49,999	194 (19.4)	139 (21.1)	333 (20.1)	
$50,000 - $74,999	278 (27.8)	199 (30.2)	477 (28.8)	
$75,000 - $99,999	196 (19.6)	136 (20.6)	332 (20.0)	
$100,000 +	209 (20.9)	120 (18.2)	329 (19.8)	
Male				
Less than $15,000	2 (0.3)	3 (0.7)	5 (0.5)	0.357
$15,000 - $24,999	8 (1.2)	9 (2.2)	17 (1.6)	
$25,000 - $34,999	41 (6.1)	14 (3.4)	55 (5.1)	
$35,000 - $49,999	80 (11.8)	49 (12.0)	129 (11.9)	
$50,000 - $74,999	218 (32.2)	130 (31.9)	348 (32.1)	
$75,000 - $99,999	154 (22.8)	100 (24.6)	254 (23.5)	
$100,000 +	173 (25.6)	102 (25.1)	275 (25.4)	

Note: The Nashville Office of Emergency Management did not ask this question in 2010

Table 5.7 shows changes in education levels by respondents' gender during the years 2007, 2008 and 2010. There was a significant change throughout the duration of this study in the highest grade of school and/or college year completion by female public survey respondents (χ^2=293, df=6, p<0.001). The proportion of female respondents with high school diplomas/GED decreased as time progressed, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). There was a significant change over time in the highest grade and/or college year completion by male public survey respondents (χ^2 =269 df=6, p<0.001). The proportion of male respondents with some college/vocation training decreased as this study progressed, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). The proportion of male respondents with college graduate/post graduate education increased during the duration of this study, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01).

Table 5.7 Highest grade achieved by gender at school and/or college year completion

Demographics (Public)(Q34A)	2007 *n*=2,089 *n* (%)	2008 *n*=1,968 *n* (%)	2010 *n*=1,295 *n* (%)	Total *n*=5,352 *n* (%)	*p*- value
Female					
Less than high school	2 (0.2)	3 (0.3)	1 (0.1)	6 (0.2)	< 0.001 *
High school / GED	197 (16.8)	84 (7.1)	57 (7.0)	338 (10.6)	
Some college / Vocational	0 (0.0)	233 (19.6)	132 (16.2)	365 (11.5)	
College Graduate / Post Graduate	972 (83.0)	870 (73.1)	627 (76.7)	2,469 (77.7)	
Male					
Less than high school	0 (0.0)	4 (0.5)	1 (0.2)	5 (0.2)	< 0.001 *
High school / GED	0 (0.0)	69 (8.9)	37 (7.7)	106 (4.9)	
Some college / Vocational	542 (59.0)	234 (30.1)	112 (23.4)	888 (40.8)	
College Graduate / Post Graduate	376 (41.0)	471 (60.5)	328 (68.6)	1,175 (54.0)	

Note: NA – Not Asked, 442 (7.6%) missing, * Statistically Significant

A diverse population participated in the survey over the three year study period, with significant change noted in the demography of public survey respondents (Table 5.8).

Table 5.8 Demography of public survey respondents

Demographics (Public)(Q35)	2007 n= 2,041 n (%)	2008 n= 1,950 n (%)	2010 n= 1,265 n (%)	Total n= 5,256 n (%)	p- value
Caucasian / White	1,605 (78.6)	1,553 (79.6)	1,003 (79.3)	4,161 (79.2)	< 0.001*
African-American / Black	344 (16.9)	316 (16.2)	198 (15.7)	858 (16.3)	
Hispanic / Latino	31 (1.5)	23 (1.2)	18 (1.4)	72 (1.4)	
Native American / Alaskan Native	30 (1.5)	13 (0.7)	6 (0.5)	49 (0.9)	
Inter-racial	12 (0.6)	11 (0.6)	14 (1.1)	37 (0.7)	
Asian	0 (0.0)	10 (0.5)	9 (0.7)	19 (0.4)	
Pacific Islander	0 (0.0)	6 (0.3)	0 (0.0)	6 (0.1)	
Other	19 (0.9)	18 (0.9)	17 (1.3)	54 (1.0)	

Note: 538 (9.3%) missing, * Statistically Significant

There was a significant change in the proportion of different races of females during the three years of the study (χ^2 =103, df=14, p<0.001). The proportion of African-American/Black females decreased over time, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.05). The proportion of Native American/Alaskan Native females decreased over time, with significantly more in 2007 (p<0.01) and significantly fewer in 2010 (p<0.05).

There was also a significant change in the proportion of different races of males during the three years of the study (χ^2 =151, df=14, p<0.001). The proportion of Hispanic/Latino males fluctuated over time, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.05).

Table 5.9 Public survey respondents' race and gender by year

Demographics (Public)(Q35A)	2007 *n*=1,997 *n* (%)	2008 *n*=1,886 *n* (%)	2010 *n*=1,242 *n* (%)	Total *n*=5,125 *n* (%)	*p*- value
Female					
Caucasian / White	771 (70.0)	891 (77.8)	613 (77.5)	2,275 (74.9)	
African-American / Black	300 (27.2)	209 (18.3)	145 (18.3)	654 (21.5)	< 0.001 *
Native American / Alaskan Native	30 (2.7)	7 (0.6)	3 (0.4)	40 (1.3)	
Hispanic / Latino	0 (0.0)	15 (1.3)	12 (1.5)	27 (0.9)	
Inter-racial	0 (0.0)	6 (0.5)	8 (1.0)	14 (0.5)	
Asian	0 (0.0)	5 (0.4)	5 (0.6)	10 (0.3)	
Pacific Islander	0 (0.0)	3 (0.3)	0 (0.0)	3 (0.1)	
Other	0 (0.0)	9 (0.8)	5 (0.6)	14 (0.5)	
Male					
Caucasian / White	834 (93.1)	616 (83.1)	373 (82.7)	1,823 (87.3)	
African-American / Black	0 (0.0)	94 (12.7)	51 (11.3)	145 (6.9)	< 0.001 *
Hispanic / Latino	31 (3.5)	7 (0.9)	6 (1.3)	44 (2.1)	
Inter-racial	12 (1.3)	5 (0.7)	6 (1.3)	23 (1.1)	
Native American / Alaskan Native	0 (0.0)	3 (0.4)	5 (0.4)	5 (0.2)	
Asian	0 (0.0)	5 (0.7)	4 (0.9)	9 (0.4)	
Pacific Islander	0 (0.0)	3 (0.4)	0 (0.0)	3 (0.1)	
Other	19 (2.1)	8 (1.1)	9 (2.0)	36 (1.7)	

Note: 699 (11.5%) missing, * Statistically Significant

5.2 Research Questions - Cross-Section Web-based Survey

Responses from the general public survey, with reference to knowledge/experience levels related to severe weather warning systems, are presented in this section. The results are then allocated into subsections, focusing on the General Public, Broadcast Media and Emergency Management survey data.

5.2.1 General Public Survey

This section presents the public survey results obtained for the years 2007, 2008 and 2010 demonstrating public knowledge/experience, level of preparedness, perceived risk and notification strategies for the public.

5.2.1.1 Knowledge/Experience Level of Public Respondents

This section focuses on the knowledge/experience level of public survey respondents.

In 2007, the tornado was the most reported severe weather phenomenon by respondents. Thus, these respondents also demonstrated the highest level of knowledge concerning tornadoes. However, a significant change was noted in the number of public survey respondents having tornado knowledge or experience with tornadoes over the three years of the study (χ^2 =18, df=2, $p<0.001$). The proportion of public survey respondents having tornado knowledge or experience with tornadoes decreased over time, with significantly more than expected in 2007 ($p<0.05$) and significantly fewer than expected in 2010 ($p<0.05$) (Table 5.10). With regard to the phenomenon of flooding, a significant change in flood knowledge or experience with flooding occurred during the three years of the study (χ^2 =897, df=2, $p<0.001$). The proportion of public survey respondents with flood knowledge or experience with flooding increased over time, with significantly fewer than expected in 2007 ($p<0.01$) and significantly more than expected in 2010 ($p<0.01$). However, there was a significant change noted in the number of public survey respondents not having had prior disaster experience (χ^2 =15, df=2, p=0.001). The proportion of public survey respondents not having prior disaster experience fluctuated over time, with significantly more than expected in 2008 (p<0.05) and significantly fewer than expected in 2010 (p<0.05).

Explanations of responses to the 'Other' category were elicited from the public survey respondents in 2010. The responses were as follows: thirteen respondents had experienced a natural disaster; sixty-one respondents had experienced a man-made disaster; four respondents had experienced a technological disaster; six respondents had experienced a medical disaster; and two respondents had experienced hazardous materials emergencies.

Table 5.10 Public survey respondents' experience of emergency situations

Experience (Public)(Q1)	2007	2008	2010	Total	
	n = 2,254 *n* (%)	*n*= 2,161 *n* (%)	*n*=1,379 *n* (%)	*n*= 5,794 *n* (%)	*p*-value
Tornado	1,185 (52.6)	1,075 (49.7)	623 (45.2)	2,883 (49.8)	< 0.001*
Flood	293 (13.0)	230 (10.6)	679 (49.2)	1,202 (20.7)	< 0.001 *
Hurricane	391 (17.3)	323 (14.9)	207 (15.0)	921 (15.9)	0.055
Fire	354 (15.7)	320 (14.8)	221 (16.0)	895 (15.4)	0.564
Earthquake	106 (4.7)	123 (5.7)	58 (4.2)	287 (5.0)	0.109
Disease	42 (1.9)	53 (2.5)	38 (2.8)	133 (2.3)	0.181
Terrorist	52 (2.3)	47 (2.2)	34 (2.5)	133 (2.3)	0.852
None	641 (28.4)	695 (32.2)	364 (26.4)	1,700 (29.3)	0.001 *
Other	279 (12.4)	246 (11.4)	Specified	525 (11.9)	0.308

Note: * Statistically Significant, Specified – where asked in 2010 to specify the 'Other' category

Depth of impact of emergency situations is shown in Table 5.11. A fluctuation was noted among respondents who had lost electricity for three days in 2008, 43.2% (933) to 50.2% (692) in 2010 (χ^2 =17, df =2, p<0.001). A fluctuation was also noted for public survey respondents who had left work because of a disaster, from 27.0% (583) in 2008 to 32.1% (442) in 2010 (χ^2 =11, df =2, p=0.005). Moreover, there was a fluctuation noted in the respondents who were unable to go shopping for three days, 12.5% (271) in 2008 to 20.7% (286) in 2010 (χ^2 =50, df =2, p<0.001). The study shows a fluctuation in the number of public survey respondents for whom evacuation from their community/neighbourhood was necessary, from 7.2% (155) in 2008 to 12.0% (165) in 2010 (χ^2 =29, df =2, p<0.001). There was a fluctuation in the number of public survey respondents having to leave their home for at least one night, from 26.2% (566) in 2008 to 32.2% (445) in 2010 (χ^2 =16, df=2, p<0.001).

Table 5.11 Impact from various emergencies experienced by public survey respondents

Knowledge / Experience (Public)(Q2)	**2007**	**2008**	**2010**	**Total**	
	n=2,254 *n* (%)	*n*=2,161 *n* (%)	*n*=1,379 *n* (%)	*n*= 5,794 *n* (%)	*p*-value
Lost electricity for three days?	1,054 (46.8)	933 (43.2)	692 (50.2)	2,679 (46.2)	< 0.001 *
Saw others injured or killed?	735 (32.6)	649 (30.0)	401 (29.1)	1,785 (30.8)	0.050
Had to leave work	641 (28.4)	583 (27.0)	442 (32.1)	1,666 (28.8)	0.005 *
Had to leave home for at least a night?	624 (27.7)	566 (26.2)	445 (32.3)	1,635 (28.2)	< 0.001 *
Could not get in touch with other family members?	612 (27.2)	584 (27.0)	407 (29.5)	1,603 (27.7)	0.213
Provided first aid?	549 (24.4)	516 (23.9)	323 (23.4)	1,388 (24.0)	0.810
Could not get to a store for three days?	306 (13.6)	271 (12.5)	286 (20.7)	863 (14.9)	< 0.001*
Got injured?	312 (13.8)	263 (12.2)	167 (12.1)	742 (12.8)	0.170
Evacuate their community or neighbourhood?	170 (7.5)	155 (7.2)	165 (12.0)	490 (8.5)	< 0.001 *
None of these	426 (18.9)	504 (23.3)	259 (18.8)	1,189 (20.5)	< 0.001 *

Note: * Statistically Significant

Table 5.12 demonstrates that the majority of respondents had knowledge of a community alert system in their area. In total, 77.1% (3,650) of the respondents knew of some type of emergency alert system in the community. An increase in the number of respondents who knew of a community warning system, or similar systems in the community, occurred from 75.2% (1,301) in 2007 to 79.4% (939) in 2010 (χ^2 =7, df=2, p=0.029).

Table 5.12 Public survey respondents with knowledge of a community warning system in their area

Knowledge / Experience (Public)(Q6)	2007	2008	2010	Total	
	n=1,730 *n* (%)	*n*=1,822 *n* (%)	*n*=1,183 *n* (%)	*n*=4,735 *n* (%)	*p*- value
Community Warning Siren	1,301 (75.2)	1,410 (77.4)	939 (79.4)	3,650 (77.1)	0.029

Note: 1,059 (18.3%) missing

The study shows a significant change in the number of respondents (Table 5.13) who were not confident in their local government's emergency preparedness during the three years of the study (χ^2 =216, df=4, p<0.001). The proportion of public survey respondents who were not confident in emergency preparedness on the part of their local government decreased over time, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). There was a significant change in the number of respondents who expressed great confidence in local government's preparation for emergencies over the three years of the study (χ^2 =216 df=4, p<0.001). The proportion of public survey respondents with great confidence in local government's preparation for emergencies increased over time, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01).

Table 5.13 Public survey respondents' confidence levels with reference to their local government preparations for emergencies e.g. natural disasters or terrorist attacks

Knowledge / Experience (Public)(Q14)	2007 *n*=2,147 *n* (%)	2008 *n*=2,050 *n* (%)	2010 *n*=1,354 *n* (%)	Total *n*=5,551 *n* (%)	*p*-value
Not Confident	667 (31.1)	590 (28.8)	195 (14.4)	1,452 (26.2)	< 0.001 *
Somewhat Confident	1,269 (59.1)	1,248 (60.9)	857 (63.3)	3,374 (60.8)	
Very Confident	211 (9.8)	212 (10.3)	302 (22.3)	725 (13.1)	

Note: 243 (4.2%) missing, * Statistically Significant

Table 5.14 indicates that 79.8% (3,480) of the respondents to the public survey in year 2007 and 2008 were familiar with the manner in which to report suspicious criminal/possible terrorist activity. There was no significant change in respondents' knowledge with regard to reporting this type of phenomenon during the three years of the study.

Table 5.14 Public survey respondents' knowledge and experience with reference to reporting criminal or terrorist activity

Knowledge / Experience (Public)(Q17)	2007 *n*=2,224 *n* (%)	2008 *n*=2,136 *n* (%)	Total *n*=4,360 *n* (%)	*p*- value
Report Suspicious Criminal/ Possible Terrorist Activity	1,760 (79.1)	1,720 (80.5)	3,480 (79.8)	0.520

Note: The Nashville Office of Emergency Management did not ask this question in 2010.

5.2.1.2 Level of Preparedness of Public Respondents

This section reviews the responses from the public surveys related to levels of preparedness.

Slightly more than a third of the respondents either had seen or heard a message associated with emergency preparedness. Table 5.15 shows that during a two-year period 36.7% (1,620) of the respondents stated they had seen or heard an emergency preparedness message within the last 30 days. There was very little change in the number of respondents having heard or seen a message related to emergency preparedness during the three years of this study.

Table 5.15 Public survey respondents' awareness of messages encouraging public preparation for emergencies within the previous 30 days

Level of Preparedness (Public)(Q10)	2007	2008	Total	
	n=2,254 *n* (%)	*n*=2,161 *n* (%)	*n*=4,415 *n* (%)	*p*- value
Preparedness Messages	810 (35.9)	810 (37.5)	1,620 (36.7)	0.287

Note: The Nashville Office of Emergency Management survey did not ask this question in 2010.

Table 5.16 shows there was a significant change in the number of respondents interested in taking zero-cost preparedness courses over the three years of the study (χ^2 =20, df=4, p=0.001). The proportion of public survey respondents interested in taking zero-cost preparedness courses decreased over time, with significantly more than expected in 2007 ($p<0.05$) and significantly fewer than expected in 2010 ($p<0.05$).

Table 5.16 Interest in free classes for emergency preparedness

Level of Preparedness (Public)(Q13)	2007	2008	2010	Total	
	n=2,222 *n* (%)	*n*=2,144 *n* (%)	*n*=1,366 *n* (%)	*n*=5,732 *n* (%)	*p*- value
Preparedness Classes	1,184 (53.3)	1,034 (48.2)	642 (47.0)	2,860 (49.9)	0.001 *

Note: 62 (1.1%) missing, * Statistically Significant

During the three years of the study, 16% (925) of the respondents from the public survey specified that they were involved in a Neighbourhood Watch Group (Table 5.17). The number of respondents who were active in Neighbourhood Watch Groups remained stable, with only a small decrease from 17.4% (392) in 2007 to 15.0% (324) in 2008.

Table 5.17 Public survey respondents active in a Neighbourhood Watch Group

Level of Preparedness (Public)(Q16)	2007 *n*=2,254 *n* (%)	2008 *n*=2,161 *n* (%)	2010 *n*=1,373 *n* (%)	Total *n*=5,788 *n* (%)	*p*- value
Neighbourhood Watch Group	392 (17.4)	324 (15.0)	209 (15.2)	925 (16.0)	0.064

Note: 6 (0.1%) missing

There was a significant change in public survey respondents interested in joining a Neighbourhood Watch Group over the three year period of the study ($\chi^2 = 27$, df=2, $p<0.001$) (Table 5.18). The proportion of public survey respondents interested in joining a Neighbourhood Watch Group increased over time, with significantly fewer than expected in 2007 ($p<0.05$) and significantly more than expected in 2010 ($p<0.01$).

Table 5.18 Public survey respondents interested in joining a Neighbourhood Watch Group

Knowledge / Experience (Public)(Q16a)	2007 *n*=2,254 *n* (%)	2008 *n*=2,161 *n* (%)	2010 *n*=1,151 *n* (%)	Total *n*=5,566 *n* (%)	*p*- value
Joining Neighbourhood Watch Group	743 (33.0)	751 (34.8)	481 (41.8)	1,975 (35.5)	< 0.001 *

Note: 228 (3.9%) missing, * Statistically Significant

The number of respondents with NOAA Weather Alert Radios shows little change throughout the three years of the study (Table 5.19).

Table 5.19 Public survey respondents with an Emergency Alert Weather Radio in the home

Level of Preparedness (Public)(Q18)	2008	2010	Total	
	n=2,107 *n* (%)	*n*=1,369 *n* (%)	*n*=3,476 *n* (%)	*p*- value
Weather Alert Radio	731 (34.7)	453 (33.1)	1,184 (34.1)	0.330

Note: The Nashville Office of Emergency Management did not ask this question in 2007.

Table 5.20 provides a list of preparedness activities that were potentially employable by the public survey respondents. There was a fluctuation over time with regard to the following: disaster supply kit for the home increased from 33.2% (718) in 2008 to 46.9% (481) in 2010 (χ^2 =64, df=2, p<0.001) and volunteering during emergencies increased from 10.3% (223) in 2008 to 15.0% (154) in 2010 (χ^2 =15, df=2, p<0.001).

There was an increase over time with regard to the following: disaster supply kit for the car increased from 23.0% (518) in 2007 to 31.6% (324) in 2010 (χ^2 =32, df=2, p<0.001); disaster supply kit for the office increased from 6.3% (141) in 2007 to 8.6% (88) in 2010 (χ^2 =6, df=2, p=0.043); development of a communication plan increased from 19.3% (435) in 2007 to 28.0% (287) in 2010 (χ^2 =34, df=2, p<0.001); identification of a meeting location for family members increased from 20.7% (467) in 2007 to 31.5% (232) in 2010 (χ^2 =50, df=2, p<0.001); exercising emergency drills at home increased from 5.7% (129) in 2007 to 11.4% (117) in 2010 (χ^2 =34, df=2, p<0.001); and completion of first-aid classes increased from 38.8% (874) in 2007 to 61.3% (628) in 2010 (χ^2 =145, df=2, p<0.001). There was little change in public survey respondents completing Community Emergency Response Training (CERT) and doing nothing to be prepared for a disaster over the three years of the study.

Table 5.20 Emergency preparedness activities undertaken by public survey respondents

Level of Preparedness (Public)(Q19)	**2007**	**2008**	**2010**	**Total**	
	n=2,254 *n* (%)	*n*=2,161 *n* (%)	*n*=1,025 *n* (%)	*n*= 5,440 *n* (%)	*p*-value
Taken a First Aid Class	874 (38.8)	956 (44.2)	628 (61.3)	2,458 (45.2)	< 0.001 *
Disaster Supply Kit for Home	767 (34.0)	718 (33.2)	481 (46.9)	1,966 (36.1)	< 0.001 *
Disaster Supply Kit for Car	518 (23.0)	503 (23.3)	324 (31.6)	1,345 (24.7)	< 0.001 *
Identified Meeting Location for Family	467 (20.7)	472 (21.8)	323 (31.5)	1,262 (23.2)	< 0.001 *
Communication Plan for Family	435 (19.3)	471 (21.8)	287 (28.0)	1,193 (21.9)	< 0.001 *
Volunteered for Emergencies	258 (11.4)	223 (10.3)	154 (15.0)	635 (11.7)	0.001 *
Practiced Drills at Home	129 (5.7)	151 (7.0)	117 (11.4)	397 (7.3)	< 0.001 *
Taken a CERT Class	NA	257 (11.9)	138 (13.5)	395 (12.4)	0.209
Disaster Supply Kit for the Office	141 (6.3)	143 (6.6)	88 (8.6)	372 (6.8)	0.043 *
Nothing	704 (31.2)	635 (29.4)	NA	1,339 (30.3)	0.182
Other	185 (8.2)	164 (7.6)	48 (3.5)	397 (6.9)	< 0.001 *

Note: NA – Not Asked, 354 (6.1%) missing, * Statistically Significant

A list of necessary items to store in a disaster supply kit is shown in Table 5.21. An increase in respondents' acquisition of emergency supplies is noted as follows: first aid kit, from 38.3% (864) in 2007 to 73.2% (506) in 2010 (χ^2 =296, df=2, p<0.001). A fluctuation in respondents' acquisition of emergency supplies is noted as follows: flashlights, from 46.4% (1,003) in 2008 to 86.1% (595) in 2010 (χ^2 =360, df=2, p<0.001); extra batteries, from 38.2% (826) in 2008 to 71.6% (495) in 2010 (χ^2 =263, df=2, p<0.001); standard AM/FM radio, from 36.0% (779)

in 2008 to 62.5% (432) in 2010 (χ^2 =160, df=2, p<0.001); three-day supply of food, from 30.7% (663) in 2008 to 54.5% (376) in 2010 (χ^2 =135, df=2, p<0.001); three-day supply of water, from 29.2% (630) in 2008 to 62.1% (429) in 2010 (χ^2 =265, df=2, p<0.001); and a three-day supply of medicines, from 26.2% (566) in 2008 to 46.4% (320) in 2010 (χ^2 =108, df=2, p<0.001). The number or respondents with NOAA Weather Radios remained stable, changing only slightly from 24.1% (544) in 2007 to 23.0% (498) in 2008.

Table 5.21 Disaster kit supplies acquired by public survey respondents

Level of Preparedness (Public)(Q20)	**2007**	**2008**	**2010**	**Total**	
	n=2,2254 *n* (%)	*n*=2,161 *n* (%)	*n*=689 *n* (%)	*n*= 5,104 *n* (%)	*p*-value
Flashlight	1,091 (48.4)	1,003 (46.4)	595 (86.1)	2,689 (52.7)	< 0.001 *
Extra Batteries	886 (39.3)	826 (38.2)	495 (71.6)	2,207 (43.2)	< 0.001 *
Standard AM/FM Radio	869 (38.6)	779 (36.0)	432 (62.5)	2,080 (40.7)	< 0.001 *
First Aid Kit	864 (38.3)	830 (38.4)	506 (73.2)	2,200 (43.1)	< 0.001 *
Three (3) Day Supply of Food	746 (33.1)	663 (30.7)	376 (54.5)	1,785 (35.0)	< 0.001 *
Three (3) Day Supply of Water	719 (31.9)	630 (29.2)	429 (62.1)	1,778 (34.8)	< 0.001 *
Three (3) Day Supply of Medicines	631 (28.0)	566 (26.2)	320 (46.4)	1,517 (29.7)	< 0.001 *
NOAA Weather Radio	544 (24.1)	498 (23.0)	NA	1,042 (23.6)	0.394

Note: NA – Not Asked, 688 (11.9%) missing, * Statistically Significant

The study shows that 49.1% (593) of the public respondents in 2007 updated their disaster kits within the previous six months compared to 52.0% (588) in 2008 (Table 5.22). There was very little change throughout the three years of the study even though there had been natural disasters which had impacted on the area.

Table 5.22 Variability of time intervals for updating supplies in disaster kits by public survey respondents

Level of Preparedness (Public)(Q20A)	2007	2008	Total	
	n=1,209 *n* (%)	*n*=1,131 *n* (%)	*n*= 2,340 *n* (%)	*p*-value
Within the last month	204 (16.9)	197 (17.4)	401 (17.1)	0.546
2 – 6 months ago	389 (32.2)	391 (34.6)	780 (33.3)	
7 – 12 months ago	233 (19.3)	205 (18.1)	438 (18.7)	
More than a year ago	383 (31.7)	338 (29.9)	721 (30.8)	

Note: The Nashville Office of Emergency Management did not ask this question in 2010.

In 2007, 36.8% (369) of the public respondents had updated family communication plans in the previous six months compared to 38.7% (373) in 2008 (Table 5.23). There was little change in the number of respondents having family communication plans throughout the three years of the study.

Table 5.23 Public survey respondents' family communication plans

Level of Preparedness (Public)(Q21)	2007	2008	Total	
	n=1,002 *n* (%)	*n*=963 *n* (%)	*n*=1,965 *n* (%)	*p*-value
Within the last month	110 (11.0)	108 (11.2)	218 (11.1)	0.843
2 – 6 Months Ago	259 (25.8)	265 (27.5)	524 (26.7)	
7 – 12 Months Ago	168 (16.8)	157 (16.3)	325 (16.5)	
More than a year ago	465 (46.4)	433 (45.0)	898 (45.7)	

Note: The Nashville Office of Emergency Management survey did not ask this question in 2010.

The public survey revealed little change over time in respondents' ability to communicate with specific persons living outside the community if separated during an emergency (Table 5.24).

Table 5.24 Number of public survey respondents' with communication plans, including outside help

Level of Preparedness (Public)(Q21A)	2007 *n*=1,021 *n* (%)	2008 *n*=932 *n* (%)	Total *n*=2,013 *n* (%)	*p*- value
Communication Plan	506 (49.6)	490 (49.4)	996 (49.5)	0.941

Note: The Nashville Office of Emergency Management did not ask this question in 2010.

There was a significant change in respondents' explanations for lack of preparedness regarding cost over time (χ^2 =32, df=2, p<0.001). The proportion of public survey respondents who expressed cost was a reason for the lack of preparedness increased as this study progressed, with significantly fewer than expected in 2007 (p<0.05) and significantly more than expected in 2010 (p<0.01). There was a significant change in public survey respondents who expressed time as a reason for lack of preparedness over the three year study period (χ^2 =20, df=2, p<0.001). The proportion of public respondents who expressed time as a reason for the lack of preparedness increased during the three years of this study, with significantly fewer than expected in 2007 (p<0.05) and significantly more than expected in 2010 (p<0.01)(Table 5.25). Little change over time in responses of the respondents were noted in other areas, including respondents not having given sufficient thought to the occurrence of an emergency, not expectant of an emergency in the area, lack of willingness to give thought to the impact of an emergency, uncertainty as to proper preparation, lack of effective protection available in the event of an emergency and insufficient room to house an emergency kit.

Table 5.25 Public survey respondents’ major reasons for not being prepared for an emergency situation

Level of Preparedness (Public) (Q22)	2007	2008	2010	Total	
	n=2,254 *n* (%)	*n*=2,161 *n* (%)	*n*=1,048 *n* (%)	*n*= 5,463 *n* (%)	p-value
Have not thought about it enough	1,360 (60.3)	1,306 (60.4)	691 (65.9)	3,357 (61.4)	0.004 *
Do not think an emergency will happen here	309 (13.7)	270 (12.5)	147 (14.0)	726 (13.3)	0.363
Do not want to think about it	209 (9.3)	198 (9.2)	102 (9.7)	509 (9.3)	0.869
Cost too much money	158 (7.0)	167 (7.7)	133 (12.7)	458 (8.4)	< 0.001 *
Do not know how to prepare	189 (8.4)	175 (8.1)	89 (8.5)	453 (8.3)	0.910
Takes too much time	87 (3.9)	110 (5.1)	79 (7.5)	276 (5.1)	< 0.001 *
Nothing would be effective	90 (4.0)	79 (3.7)	38 (3.6)	207 (3.8)	0.803
Do not have room for an emergency kit	65 (2.9)	56 (2.6)	47 (4.5)	168 (3.1)	0.012 *

Note: 331 (5.7%), * Statistically Significant

There was a significant change in the number of public respondents who said that being self-sufficient was a reason for being prepared over the three years of the study (χ^2 =245, df=2, p<0.001). The proportion also increased during the duration of this study, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01). There was a significant change in the number of public respondents who said they had prior emergency experience over the three years of the study (χ^2 =161, df=2, p<0.001). The proportion increased as the study progressed, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01). There was a significant change over time in the number of public respondents who said they were better prepared because they were responsible for children during the three years of the study (χ^2 =46, df=2, p<0.001). The proportion increased during the three years of this study, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01). There was a significant change over time in the number of public respondents who said they were better prepared because they were responsible for elderly/disabled persons over the three year study period (χ^2 =14, df=2, p=0.001). The proportion increased as the study progressed, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01) (Table 5.26). Little change was noted with regard to the 'Live in a high risk area' response.

Table 5.26 Reasons for being well prepared identified by the public survey respondents

Level of Preparedness (Public)(Q23)	**2007**	**2008**	**2010**	**Total**	
	n=2,254 *n* (%)	*n*=2,161 *n* (%)	*n*=988 *n* (%)	*n*= 5,409 *n* (%)	*p*-value
Think it is important to be self-sufficient	936 (41.5)	903 (41.8)	683 (69.1)	2,522 (46.7)	< 0.001 *
Been through emergency before	497 (22.0)	499 (23.1)	417 (42.2)	1.413 (26.1)	< 0.001 *
Responsible for children	449 (19.9)	489 (22.6)	304 (30.8)	1,242 (23.0)	< 0.001 *
Responsible for elderly / disable	118 (5.2)	137 (6.3)	86 (8.7)	341 (6.3)	0.001 *
Live in a high risk area	73 (3.2)	73 (3.4)	41 (4.1)	187 (3.5)	0.430

Note: 385 (6.6%) missing, * Statistically Significant

During the course of the study period (2007, 2008 and 2010) it was found that on average, 70.2% (3,885) of the public survey respondents knew how to turn off home utilities (Table 5.27). This percentage of respondents remained consistent (p=0.945) throughout the three years of this study.

Table 5.27 Public survey respondents' knowledge of utilities such as gas, electricity or water

Level of Preparedness (Public)(Q25)	2007 *n*=2,118 *n* (%)	2008 *n*=2,050 *n* (%)	2010 *n*=1,366 *n* (%)	Total *n*=5,534 *n* (%)	*p*- value
Utilities	1,482 (70.0)	1,440 (70.2)	963 (70.5)	3,885 (70.2)	0.945

Note: 260 (4.5%) missing

5.2.1.3 Perceived Risk by Public Respondents

This section focuses on the responses from the public survey related to perceived risk.

There was a significant change over time in the respondents' expectations of the likelihood of a natural disaster within the forthcoming two years over the three years of the study (χ^2 =69, df=6, p<0.001) (Table 5.28). The proportion of public survey respondents' consideration of the probability of a natural disaster not occurring in the Nashville Metropolitan Statistical Area (MSA) decreased during the period of this study, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). The proportion of public survey respondents who felt that natural disasters definitely will occur in the Nashville Metropolitan Statistical Area (MSA) increased throughout the length of this study with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01).

Respondents' views of the likelihood of a terrorist event definitely not occurring within two years showed change over time (χ^2 =31, df=6, p<0.001). The proportion increased as the study progressed, with significantly fewer than expected in 2007 ($p<0.05$) and significantly more than expected in 2010 ($p<0.05$). The proportion of public survey respondents' view that a terrorist event probably will occur fluctuated over time, with significantly more than expected in 2007 ($p<0.01$) and significantly fewer than expected in 2008 ($p<0.05$).

There was a significant change over time in the public respondents views that a public health event will definitely not occur (χ^2 =55, df =6, $p<0.001$). The proportion decreased throughout the duration of this study, with significantly more than expected in 2007 ($p<0.01$) and significantly fewer than expected in 2010 ($p<0.01$).

Table 5.28 Respondents' views of the likelihood of a natural, terrorist or public health disaster within the next two years

Perceived Risk (Public)(Q3)	2007 *n*= 2,225 *n* (%)	2008 *n*=2,145 *n* (%)	2010 *n*= 1,357 *n* (%)	Total *n*= 5,727 *n* (%)	*p*-value
Likelihood - Natural					
Definitely Will Not	23 (1.0)	16 (0.7)	7 (0.5)	46 (0.8)	< 0.001 *
Probably Will Not	691 (31.1)	558 (26.0)	304 (22.4)	1,553 (27.1)	
Probably Will	1,270 (57.1)	1,235 (57.6)	788 (58.1)	3,293 (57.5)	
Definitely Will	241 (10.8)	336 (15.7)	258 (19.0)	835 (14.6)	
Perceived Risk (Public)	**2007** *n*= 2,050 *n* (%)	**2008** *n* = 1,974 *n* (%)	**2010** *n*=1,107 *n* (%)	**Total** *n* = 5,131 *n* (%)	
Likelihood – Terrorist					
Definitely Will Not	116 (5.3)	134 (6.4)	107 (8.1)	357 (6.4)	< 0.001 *
Probably Will Not	1,547 (70.6)	1,573 (75.0)	952 (72.2)	4,072 (72.6)	
Probably Will	483 (22.0)	358 (17.1)	238 (18.1)	1,079 (19.2)	
Definitely Will	46 (2.1)	32 (1.5)	21 (1.6)	99 (1.8)	
Perceived Risk (Public)	**2007** *n*= 2,066 *n* (%)	**2008** *n* = 1,996 *n* (%)	**2010** *n*=1,125 *n* (%)	**Total** *n* = 5,187 *n* (%)	
Likelihood – Public Health					
Definitely Will Not	128 (5.8)	103 (4.9)	15 (1.1)	246 (4.3)	< 0.001 *
Probably Will Not	1,233 (55.8)	1,157 (54.6)	719 (53.7)	3,109 (54.6)	
Probably Will	756 (34.2)	758 (35.8)	543 (40.6)	2,057 (36.3)	
Definitely Will	91 (4.1)	102 (4.8)	62 (4.6)	255 (4.5)	

Note: Natural – 67 (1.2%) missing, Terrorist – 187 (3.2%) missing, and Health – 127 (2.2%) missing, * Statistically Significant

If asked by the government to evacuate their homes, 72.6% (4,365) of the respondents (Table 5.29) had both a place to stay and a way to get there. However, over a fifth of the respondents, 21.8% (1,248), had no alternative place to stay (although they did have transportation to evacuate). There was little change over time from the respondents' willingness to evacuate outside the metropolitan area.

Table 5.29 Public survey respondents' ability to evacuate a metropolitan area

Perceived Risk (Public)(Q4)	**2007** *n*=2,226 *n* (%)	**2008** *n*=2,127 *n* (%)	**2010** *n*=1,374 *n* (%)	**Total** *n*= 5,727 *n* (%)	*p*-value
Evacuate Outside Area -					
Have a place to stay and have transportation to get there	1,714 (77.0)	1,623 (76.3)	1,028 (74.8)	4,365 (76.2)	0.399
Have transportation available, but no place to stay	465 (20.9)	461 (21.7)	322 (23.4)	1,248 (21.8)	
Have a place to stay, but no transportation to get there	28 (1.3)	20 (0.9)	10 (0.7)	58 (1.0)	
Have no place to stay and no transportation to get there	19 (0.9)	23 (1.1)	14 (1.0)	56 (1.0)	

Note: 67 (1.2%) missing

There was a significant change during the duration of this study in the number of public respondents who were somewhat unlikely to evacuate to a shelter during the three years of the study (χ^2 =60, df=10, p<0.001) (Table 5.30). The proportion increased as the study progressed, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01).

Table 5.30 Shelter evacuations by public survey respondents

Perceived Risk (Public)(Q5)	**2007** *n*=2,197 *n* (%)	**2008** *n*=2,108 *n* (%)	**2010** *n*=1,370 *n* (%)	**Total** *n*= 5,675 *n* (%)	*p*-value
Definitely Would Not	93 (4.2)	106 (5.0)	46 (3.4)	245 (4.3)	< 0.001 *
Very Unlikely	263 (12.0)	221 (10.5)	136 (9.9)	620 (10.9)	
Somewhat Unlikely	260 (11.8)	274 (13.0)	267 (19.5)	801 (14.1)	
Somewhat Likely	494 (22.5)	447 (21.2)	286 (20.9)	1,227 (21.6)	
Very Likely	568 (25.9)	534 (25.3)	368 (26.9)	1,470 (25.9)	
Definitely Would	519 (23.6)	526 (25.0)	267 (19.5)	1,312 (23.1)	

Note: 119 (2.1%) missing, * Statistically Significant

Table 5.31 shows decreases in the reasons given by public survey respondents for unwillingness to evacuate their home during the course of the study. The situations identified in this table merited the following responses: availability of alternate place to go if needed, from 37.1% (836) in 2007 to 22.1% (305) in 2010 (χ^2 =112, df=2, p<0.001); concern about pets, from 34.9% (786) in 2007 to 19.6% (270) in 2010 (χ^2 =98, df=2, p<0.001); a need to protect the home, from 28.4% (641) in 2007 to 13.1% (181) in 2010 (χ^2 =128, df=2, p<0.001): concern about crime/danger in the area, from 27.6% (622) in 2007 to 13.1% (181) in 2010 (χ^2 =110, df=2, p<0.001); concern about food/water/supplies in public shelters, from 26.1% (588) in 2007 to 10.7% (148) in 2010 (χ^2 =122, df=2, p<0.001); concern about possessions within the home, from 21.1% (475) in 2007 to 10.4% (144) in 2010 (χ^2 =75, df=2, p<0.001); dislike of large crowds, from 19.3% (435) in 2007 to 12.5% (173) in 2010 (χ^2 =31, df=2, p<0.001); lack of knowledge of locations of public emergency shelters, from 20.2% (455) to 6.4% (88) in 2010 (χ^2 =142, df=2, p<0.001); necessity of caring for other individuals, from 13.6% (307) in 2007 to 5.9% (81) in 2010 (χ^2 =61, df=2, p<0.001); and functional needs potentially preventing evacuating, from 3.0% (67) in 2007 to 1.4% (19) in 2010 (χ^2 =10, df=2, p=0.008).

The public survey respondents' unwillingness to evacuate their home fluctuated over the course of the study. The situations identified in this table merited the following responses: lack of trust in government provision, from 13.5% (292) in 2008 to 6.0% (83) in 2010 (χ^2 =55, df=2, p<0.001); confidence in home withstanding a disaster, from 9.3% (200) in 2008 to 4.2% (58) in 2010 (χ^2 =37, df=2, p<0.001); and personal illness, from 2.8% (61) in 2008 to 1.0% (14) in 2010 (χ^2 =13, df=2, p=0.001).

Table 5.31 Reasons given by public survey respondents for not being willing to evacuate their home

Perceived Risk (Public)(Q5A)	**2007**	**2008**	**2010**	**Total**	
	n=2,254 *n* (%)	*n*=2,161 *n* (%)	*n*=1,379 *n* (%)	*n*= 5,794 *n* (%)	*p*-value
Have alternative place to go	836 (37.1)	821 (38.0)	305 (22.1)	1,962 (33.9)	< 0.001 *
Concerned about my pets	786 (34.9)	670 (31.0)	270 (19.6)	1,726 (29.8)	< 0.001 *
To protect my home	641 (28.4)	603 (27.9)	181 (13.1)	1,425 (24.6)	< 0.001 *
Concerned about crime / danger	622 (27.6)	559 (25.9)	181 (13.1)	1,362 (23.5)	< 0.001 *
Concerned about food / water / supplies in shelter	588 (26.1)	511 (23.6)	148 (10.7)	1,247 (21.5)	< 0.001 *
Concerned about my possessions	475 (21.1)	440 (20.4)	144 (10.4)	1,059 (18.3)	< 0.001 *
Dislike of crowds	435 (19.3)	407 (18.8)	173 (12.5)	1,015 (17.5)	< 0.001 *
Not knowing locations of public emergency shelters	455 (20.2)	434 (20.1)	88 (6.4)	977 (16.9)	< 0.001 *
Have people in my care	307 (13.6)	292 (13.5)	81 (5.9)	680 (11.7)	< 0.001 *
Lack of trust in government	298 (13.2)	292 (13.5)	83 (6.0)	673 (11.6)	< 0.001 *
Home could withstand event	132 (5.9)	200 (9.3)	58 (4.2)	390 (6.7)	< 0.001 *
Not able to get to the shelter	105 (4.7)	119 (5.5)	NA	224 (5.1)	0.199
Personal Illness	54 (2.4)	61 (2.8)	14 (1.0)	129 (2.2)	0.001 *
Have functional needs that may prevent evacuating	67 (3.0)	59 (2.7)	19 (1.4)	145 (2.5)	0.008
Lack of transportation	31 (1.4)	25 (1.2)	11 (0.8)	67 (1.2)	0.287

Note: NA – Not Asked, * Statistically Significant

5.2.1.4 Alert/Notification Communication Strategy

This section focuses on the public responses related to emergency alerts/notifications.

Table 5.32 shows the number of respondents polled who watched Metropolitan 3 Government Access Television in 2007 and 2008: 41.1% (1,798). A decrease, from 42.8% (965) in 2007 to 39.3% (842) in 2008, was noted in the number of respondents who watched the government access television station (χ^2 =7, df =2, p=0.034).

Table 5.32 Public survey respondents who watch Metro 3 Government Access Television

Communication (Public)(Q11)	2007 *n*=2,235 *n* (%)	2008 *n*=2,143 *n* (%)	Total *n*=4,378 *n* (%)	*p*- value
Metro 3 – Government Access Television	956 (42.8)	842 (39.3)	1,798 (41.1)	0.034*

Note: The Nashville Office of Emergency Management did not ask this question in 2010. * Statistically Significant

As shown in Table 5.33, there was a significant change during the three years of this study in numerous areas relating to reliable emergency messaging (χ^2 =1,340, df=34, p<0.001). The proportions of public respondents who expressed reliability on television/news for emergency messaging fluctuated over time, with significantly more than expected in 2008 (p<0.05) and significantly fewer than expected in 2010 (p<0.01). The proportion of public respondents who indicated radio stations as reliable for emergency messaging decreased as the study progressed over the three year period, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). The proportions of public respondents who expressed confidence in reliance upon emails for emergency messaging fluctuated over time, with significantly more than expected in 2008 (p<0.01) and significantly fewer than expected in 2010 (p<0.01).

Table 5.33 Reliable emergency messaging for public survey respondents

Communication (Public)(Q12)	2007 *n*=2,223 *n* (%)	2008 *n*=2,161 *n* (%)	2010 *n*=1,371 *n* (%)	Total *n*=5,755 *n* (%)	*p*-value
Television / News	1,154 (51.9)	1,128 (52.2)	516 (37.6)	2,798 (48.6)	< 0.001 *
Mass Telephone Calls	277 (12.5)	284 (13.1)	149 (10.9)	710 (12.3)	
Radio Stations	329 (14.8)	239 (11.1)	121 (8.8)	689 (12.0)	
Email	209 (9.4)	229 (10.6)	72 (5.3)	510 (8.9)	
NOAA Weather Radio	72 (3.2)	111 (5.1)	77 (5.6)	260 (4.5)	
Highway Message Boards	43 (1.9)	39 (1.8)	20 (1.5)	102 (1.8)	
Internet	42 (1.9)	31 (1.4)	24 (1.8)	97 (1.7)	
Television / Government Access	27 (1.2)	18 (0.8)	11 (0.8)	56 (1.0)	
Other	70 (3.1)	82 (3.8)	NA	152 (2.6)	
Text Messages	NA	NA	342 (24.9)	342 (5.9)	
Community Alert Siren	NA	NA	4 (0.3)	4 (0.1)	
Emergency Alert System (EAS)	NA	NA	4 (0.3)	4 (0.1)	
No electricity, alternate notification	NA	NA	6 (0.4)	6 (0.1)	
Mail	NA	NA	1 (0.1)	1 (0.0)	
Pager	NA	NA	2 (0.1)	2 (0.0)	
In Person	NA	NA	1 (0.1)	1 (0.0)	
PA Speaker	NA	NA	2 (0.1)	2 (0.0)	
All of the above	NA	NA	19 (1.4)	19 (0.3)	

Note: NA= Not Asked, 39 (0.7%) missing, * Statistically Significant

The ‘Other’ category for 2007 was not available. The ‘Other’ category for 2008 is summarized as follows (Table 5.33a):

Table 5.33a Other Category

Public (Q12) Other: 2008	
Alert at work (public school)	Many of the above
Alert weather radio	Mass phone calls (8)
All of the above (6)	Mass texting
All above except email / phone plus television	Message board
Also mailings	Metro cellphone issued to metro employees
Also phone call and/or text to cell phone	Multiple methods
Amber alerts / radio	Need multiple approaches
Email	Neighborhood public announcement
Internet	Nextel
Radio	Non-electronic method
Another cable emergency channel; not channel 3	Not sure
Any or all of the above would be good	National Public Radio (NPR)
At my old college, there is an emergency text message	Text message – like free amber alert
Call out	Over cable television
Call out system to home	Pager
Carrier pigeons	Phone
Cell phone / text messages (34)	Phone message
Church network	Phone text
Combination of many of the choices you listed	Public radio, reverse 911
Combination of several of the above	Public report
Depends on the type of emergency, mass phone calls	Radio (9)
Don't like the line across television	Radio / weather channel
Door to door	Rolling loudspeaker
Email (4)	Sirens
Emergency Broadcast Station (EBS)	Something that does not depend on electric
Email and television news	Television
Emergency weather alert radio (2)	Television/ news (9)
From a neighbor	Telephone
Have metro radio	Text message (48)
Have no clue	Emergency radio
Highway message board (2)	There is no best way… all should be used
Home to person contact	Use more than one method, Television news, government access television, radio, etc.
I don't have cable	
I would have access to multiple on the list	Use them all
I would pick more than one method. Radio, Television and text message	Visit to area
If no power, television and internet pointless	Weather radio (3)
Internet (3)	Web site
Interrupt television broadcasts on standard and cable	What if nothing works
Local television and radio	WMSG 88.1
Loudspeakers on police cars	Work
Mail (3)	Work alert

There was a significant change as this study progressed in the means of dissemination of messages regarding free emergency preparedness classes to the general public during the three years of the study (χ^2 =688, df=20, p<0.001) (Table 5.34). The proportion of the public respondents who would utilise email communication sources to receive information about free emergency preparedness classes increased during the duration of this study, with significantly fewer than expected in 2007 (p<0.01) and significantly more than expected in 2010 (p<0.01). The proportion of the public respondents opting to receive messages regarding free emergency preparedness classes via the newspaper decreased throughout this study, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01). The proportion of the public respondents who would prefer to receive messages regarding free emergency preparedness classes via the radio decreased during the three years of this study, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2010 (p<0.01).

Table 5.34 Communication sources for free public emergency preparedness classes

Communication (Public)(Q15)	2007	2008	2010	Total	
	n=2,226 *n* (%)	*n*=2,126 *n* (%)	*n*=1,344 *n* (%)	*n*= 5,696 *n* (%)	*p*-value
Email	734 (33.0)	834 (39.7)	649 (48.3)	2,226 (39.1)	< 0.001 *
Television/News	860 (38.6)	817 (38.4)	384 (28.6)	2,061 (36.2)	
Newspaper	296 (13.3)	136 (6.4)	44 (3.3)	476 (8.4)	
Radio	152 (6.8)	113 (5.3)	45 (3.3)	310 (5.4)	
Internet	106 (4.8)	103 (4.8)	84 (6.3)	293 (5.1)	
Television/Government Access	NA	50 (2.4)	22 (1.6)	72 (1.3)	
Other	78 (3.5)	64 (3.0)	NA	142 (2.5)	
Text Messages	NA	NA	92 (6.8)	92 (1.6)	
Mail	NA	NA	11 (0.8)	11 (0.2)	
Telephone	NA	NA	4 (0.3)	4 (0.1)	
All of the above	NA	NA	9 (0.7)	9 (0.2)	

Note: NA= Not Asked, 98 (1.7%) missing, * Statistically Significant

There was a significant change over time in the methods used to obtain additional information about emergency situations over the two years (2007 and 2008) of the study (χ^2 =1,222, df=8, p<0.001) (Table 5.35). The proportion of the public respondents who utilized the community hotline as shown on television decreased as this study progressed, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.01). The proportion of the public respondents who utilized other ways of obtaining information decreased during the study period, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.01). The proportion of the public respondents who utilized non-emergency numbers decreased throughout the duration of this study, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.01). The proportion of the public respondents who relied on information from

City Hall decreased as the study progressed, with significantly more than expected in 2007 (p<0.01) and significantly fewer than expected in 2008 (p<0.01).

Table 5.35 Methods used to obtain additional information about emergency situations

Communication (Public)(Q24)	2007 *n*=2,205 *n* (%)	2008 *n*=2,117 *n* (%)	Total *n*=4,322 *n* (%)	*p*-value
Community hotline as shown on television	734 (33.3)	338 (16.0)	1,072 (24.8)	< 0.001*
None, would look for some other way of getting information	443 (20.1)	335 (15.8)	778 (18.0)	< 0.001*
Non-Emergency Number	423 (19.2)	286 (13.5)	709 (16.4)	< 0.001*
911	345 (15.6)	344 (16.2)	689 (15.9)	< 0.001 *
Emergency Management	NA	328 (15.5)	328 (7.6)	
City Hall	260 (11.8)	10 (0.5)	270 (6.2)	< 0.001*
News Stations	NA	241 (11.4)	241 (5.6)	
Red Cross	NA	137 (6.5)	137 (3.2)	
Other	NA	98 (4.6)	98 (2.3)	

Note: NA – Not Asked, The Nashville Office of Emergency Management did not ask this question in 2010,* Statistically Significant

5.2.1.5 Relationship between the knowledge/experience and the levels of preparedness in the public surveys

The information presented in this section represents collapsed data from 2007, 2008 and 2010. The relationship between knowledge/experience and the level of preparedness from the public surveys is reviewed.

Of those who participated in the survey, a significant difference is reflected in Table 5.36 between the respondents who had and who had not experienced a tornado. Those public respondents who had experienced a tornado were more prepared than those who had not experienced a tornado in terms of situational readiness, namely: the most common response among both groups, having taken a first-aid class, 49.0% (1,360) to 41.2% (1,098) (χ^2 =32, df=1, p<0.001); having a disaster kit at home, 42.4% (1,178) to 29.6% (788) (χ^2 =96, df=1, p<0.001); having a disaster kit for the car, 29.0% (807) to 20.2% (538) (χ^2 =57, df=1, p<0.001); having a family communication plan in place, 26.6% (739) to 17.1% (454) (χ^2 =79, df =1, p<0.001); having identified family meeting locations, 28.1% (728) to 18.0% (480) (χ^2 =78, df=1, p<0.001); having volunteered for emergencies, 14.7% (408) to 8.5% (227) (χ^2 =21, df=1, p<0.001); having a disaster kit for the office, 9.3% (258) to 4.3% (114) (χ^2 =53, df=1, p<0.001); and having practiced drills at home, 9.1% (253) to 5.4% (144) (χ^2 =27, df=1, p<0.001).

Table 5.36 Public survey respondents' tornado experience and level of preparedness activities

Level of Preparedness (Q19)	Experienced a Tornado (Q1)		
	No	Yes	*p*-value
	n= 2,662 *n* (%)	*n*= 2,778 *n* (%)	
Disaster Supply Kit for Home			
No	1,874 (70.4)	1,600 (57.6)	< 0.001 *
Yes	788 (29.6)	1,178 (42.4)	
Disaster Supply Kit for Car			
No	2,124 (79.8)	1,971 (71.0)	< 0.001 *
Yes	538 (20.2)	807 (29.0)	
Disaster Supply Kit for the Office			
No	2,548 (95.7)	2,520 (90.7)	< 0.001 *
Yes	114 (4.3)	258 (9.3)	
Communication Plan for Family			
No	2,208 (82.9)	2,039 (73.4)	< 0.001 *
Yes	454 (17.1)	739 (26.6)	
Identified Meeting Location for Family			
No	2,182 (82.0)	1,996 (71.9)	< 0.001 *
Yes	480 (18.0)	782 (28.1)	
Practiced Drills at Home			
No	2,518 (94.6)	2,525 (90.9)	< 0.001 *
Yes	144 (5.4)	253 (9.1)	
Taken a First Aid Class			
No	1,564 (58.8)	1,418 (51.0)	< 0.001 *
Yes	1,098 (41.2)	1,360 (49.0)	
Volunteered for Emergencies			
No	2,435 (91.5)	2,370 (85.3)	< 0.001 *
Yes	227 (8.5)	408 (14.7)	

Note: 1,472 (25.4%) missing, * Statistically Significant

With reference to the natural disaster phenomenon of flooding, the public survey shows that a significant difference between the respondents who had and who had not experienced a flood (Table 5.37). Those public respondents who had experienced a flood were more prepared than those who had not experienced a flood in terms of readiness factors, namely: the most common response among both groups, having taken a first-aid class, 61.8% (659) to 41.1% (1,799) (χ^2

=147, df=1, $p<0.001$); having a disaster kit at home, 52.7% (562) to 32.1% (1,404) (χ^2 =157, df=1, $p<0.001$); having a disaster kit for the car, 38.2% (408) to 21.4% (937) (χ^2 =130, df=1, $p<0.001$); having identified family meeting locations, 35.1% (374) to 20.3% (888) (χ^2 =105, df=1, $p<0.001$); having identified family meeting locations, 35.1% (374) to 20.3% (888) (χ^2 =105, df=1, $p<0.001$); having a family communication plan, 34.1% (364) to 19.0% (829) (χ^2 =115, df=1, $p<0.001$); having volunteered for emergencies, 21.6% (230) to 9.3% (405) (χ^2 =33, df=1, $p<0.001$); having a disaster kit for the office, 12.8% (137) to 5.4% (235) (χ^2 =75, df=1, $p<0.001$); and having practiced drills at home, 11.6% (124) to 6.2% (273) (χ^2 =37, df=1, $p<0.001$).

Table 5.37 Public survey respondents' level of preparedness for floods

Level of Preparedness (Q19)	**Experienced a Flood (Q1)**		
	No	Yes	*p*-value
	n=4,373 *n* (%)	*n*=1,067 *n* (%)	
Disaster Supply Kit for Home			
No	2,969 (67.9)	505 (47.3)	< 0.001 *
Yes	1,404 (32.1)	562 (52.7)	
Disaster Supply Kit for Car			
No	3,436 (78.6)	659 (61.8)	< 0.001 *
Yes	937 (21.4)	408 (38.2)	
Disaster Supply Kit for the Office			
No	4,138 (94.6)	930 (87.2)	< 0.001 *
Yes	235 (5.4)	137 (12.8)	
Communication Plan for Family			
No	3,544 (81.0)	703 (65.9)	< 0.001 *
Yes	829 (19.0)	364 (34.1)	
Identified Meeting Location for Family			
No	3,485 (79.7)	693 (64.9)	< 0.001 *
Yes	888 (20.3)	374 (35.1)	
Practiced Drills at Home			
No	4,100 (93.8)	943 (88.4)	< 0.001 *
Yes	273 (6.2)	124 (11.6)	
Taken a First Aid Class			
No	2,574 (58.9)	408 (38.2)	< 0.001 *
Yes	1,799 (41.1)	659 (61.8)	
Volunteered for Emergencies			
No	3,968 (90.7)	837 (78.4)	< 0.001 *
Yes	405 (9.3)	230 (21.6)	

Note: 354 (6.1%) missing, * Statistically Significant

The public survey data shows a significant difference between respondents who had and who had not been through a tornado (Table 5.38). Those public respondents who had experienced a tornado were more prepared than those who had not experienced a tornado by increasing reserves and resources as follows: the most common response among both groups, having a flashlight, 58.2% (1,536) to 46.7% (1,153) (χ^2 =68, df=1, p<0.001); having extra batteries, 49.6% (1,307) to 36.5% (900) (χ^2 =89, df=1, p<0.001); having a first-aid kit, 48.6% (1,282) to 37.2% (918) (χ^2 =68, df=1, p<0.001); having a standard AM/FM radio, 46.3% (1,220) to 34.8% (860) (χ^2 =69, df=1, p<0.001); having a standard AM/FM radio, 46.3% (1,220) to 34.8% (860) (χ^2 =69, df=1, p<0.001); having a three-day supply of water, 40.1% (1,058) to 29.2% (720) (χ^2 =67, df=1, p<0.001); having a three-day supply of food, 39.7% (1,047) to 29.9% (738) (χ^2 =54, df=1, p<0.001); and having a three-day supply of medicines, 34.4% (906) to 24.8% (611) (χ^2 =56, df=1, p<0.001);

Table 5.38 Public survey respondents' level of preparedness for tornadoes

Level of Preparedness (Public)(Q20)	Experienced a Tornado (Q1)		
	No	Yes	*p*-value
	n=2,468 *n* (%)	*n*=2,636 *n* (%)	
Three (3) Day Supply of Medicines			
No	1,857 (75.2)	1,730 (65.6)	< 0.001 *
Yes	611 (24.8)	906 (34.4)	
Three (3) Day Supply of Water			
No	1,749 (70.8)	1,579 (59.9)	< 0.001 *
Yes	720 (29.2)	1,058 (40.1)	
Three (3) Day Supply of Food			
No	1,731 (70.1)	1,590 (60.3)	< 0.001 *
Yes	738 (29.9)	1,047 (39.7)	
First Aid Kit			
No	1,551 (62.8)	1,355 (51.4)	< 0.001 *
Yes	918 (37.2)	1,282 (48.6)	
Standard AM/FM Radio			
No	1,609 (65.2)	1,417 (53.7)	< 0.001 *
Yes	860 (34.8)	1,220 (46.3)	
Flashlight			
No	1,316 (53.3)	1,101 (41.8)	< 0.001 *
Yes	1,153 (46.7)	1,536 (58.2)	
Extra Batteries			
No	1,569 (63.5)	1,330 (50.4)	< 0.001 *
Yes	900 (36.5)	1,307 (49.6)	

Note: 690 (11.9%) missing, * Statistically Significant

Table 5.39 shows significant differences between the respondents who had and who had not been through a flood. Those public respondents who had experienced a flood were more prepared than those who had not experienced a flood in terms of augmenting reserves, namely: the most common response among both groups, having extra batteries, 74.4% (679) to 47.9% (2,010) (χ^2 =215, df=1, p<0.001); having a first aid kit, 66.4% (604) to 38.0% (1,596) (χ^2 =246, df=1, p<0.001); having a flashlight, 66.1% (601) to 38.3% (1,606) (χ^2 =236, df=1, p<0.001); having a standard AM/FM radio, 58.7% (534) to 36.8% (1,546) (χ^2 =149, df=1, p<0.001); having a three-day supply of water, 54.8% (498) to 30.5% (1,280) (χ^2 =194, df=1, p<0.001); having a three-day supply of food, 54.4% (495) to 30.7% (1,290) (χ^2 =185, df=1, p<0.001); and having a three-day supply of medicine, 47.4% (430) to 25.9% (1,087) (χ^2 =164, df=1, p<0.001).

Table 5.39 Public survey respondents' level of preparedness for floods

Level of Preparedness (Public)(Q20)	**Experienced a Flood (Q1)**		
	No	Yes	*p*-value
	n=4,197 *n* (%)	*n*=909 *n* (%)	
Three (3) Day Supply of Medicines			
No	3,109 (74.1)	478 (52.6)	< 0.001 *
Yes	1,087 (25.9)	430 (47.4)	
Three (3) Day Supply of Water			
No	2,917 (69.5)	411 (45.2)	< 0.001 *
Yes	1,280 (30.5)	498 (54.8)	
Three (3) Day Supply of Food			
No	2,907 (69.3)	414 (45.5)	< 0.001 *
Yes	1,290 (30.7)	495 (54.5)	
First Aid Kit			
No	2,601 (62.0)	305 (33.6)	< 0.001 *
Yes	1,596 (38.0)	604 (66.4)	
Standard AM/FM Radio			
No	2,651 (63.2)	375 (41.3)	< 0.001 *
Yes	1,546 (36.8)	534 (58.7)	
Extra Batteries			
No	2,591 (61.7)	308 (33.9)	< 0.001 *
Yes	1,606 (38.3)	601 (66.1)	
Flashlight			
No	2,187 (52.1)	230 (25.3)	< 0.001 *
Yes	2,010 (47.9)	679 (74.7)	

Note: 668(11.9%) missing, * Statistically Significant

Table 5.40 shows significant differences between level of preparedness of respondents who had and who had not experienced a tornado. As indicated, those public respondents who had experienced a tornado were more prepared than those who had not experienced a tornado. Reasons given for lack of preparation included and ‘not thinking about it enough’ was by far most common reason chosen whether people had experienced a tornado or not, 57.3% (1,545) to 65.5% (1,812) (χ^2 =39, df=1, $p<0.001$); doubt in the likelihood of occurrence in vicinity, 11.2% (302) to 15.3% (424) (χ^2 =20, df=1, $p<0.001$); and uncertainty of manner in which to prepare, 7.3% (196) to 9.3% (257) (χ^2 =7, df=1, $p=0.007$).

Table 5.40 Public survey respondents' reasons for lack of preparedness for a tornado

Level of Preparedness (Public) (Q22)	Experienced a Tornado (Q1)		
	No	Yes	*p*-value
	n=2,767 *n* (%)	*n*=2,696 *n* (%)	
Do not think an emergency will happen here			
No	2,343 (84.7)	2,394 (88.8)	< 0.001 *
Yes	424 (15.3)	302 (11.2)	
Do not know how to prepare			
No	2,510 (90.7)	2,500 (92.7)	0.007 *
Yes	257 (9.3)	196 (7.3)	
Have not thought about it enough			
No	955 (34.5)	1,151 (42.7)	< 0.001 *
Yes	1,812 (65.5)	1,545 (57.3)	
Nothing would be effective			
No	2,664 (96.3)	2,592 (96.1)	0.794
Yes	103 (3.7)	104 (3.9)	
Cost too much money			
No	2,547 (92.0)	2,458 (91.2)	0.242
Yes	220 (8.0)	238 (8.8)	
Takes too much time			
No	2,621 (94.7)	2,566 (95.2)	0.443
Yes	146 (5.3)	130 (4.8)	
Do not want to think about it			
No	2,515 (90.9)	2,439 (90.5)	0.589
Yes	252 (9.1)	257 (9.5)	
Do not have room for an emergency kit			
No	2,683 (96.9)	2,615 (97.0)	0.770
Yes	87 (3.1)	81 (3.0)	

Note: 331 (5.7%) missing, * Statistically Significant

Comparisons are shown in Table 5.41 between respondents who had and who had not experienced a flood in terms of the reasons given for lack of preparation. Those public respondents who had experienced a flood were more prepared than those who had not experienced a flood in terms of various levels of readiness, namely: the most common response among both groups, 'have not thought about it enough', 54.5% (548) to 63.0% (2,809) (χ^2 =25, df=1, p<0.001);

too costly to prepare, 11.9% (120) to 7.6% (338) (χ^2 =20, df=1, p<0.001); too time consuming to prepare, 7.2% (72) to 4.6% (204) (χ^2 =11, df=1, p=0.001); knowledge of ways in which to prepare, 6.4% (64) to 8.7% (389) (χ^2 =6, df=1, p=0.014); and lack of confidence in effectiveness of preparedness efforts, 5.0% (50) to 3.5% (157) (χ^2 =5, df=1, p=0.029).

Table 5.41 Public survey respondents' reasons for lack of flood preparation

Level of Preparedness (Public) (Q22)	**Experienced a Flood (Q1)**		
	No	Yes	*p*-value
	n=4,458 *n* (%)	*n*=1,005 *n* (%)	
Do not think an emergency will happen here			
No	3,856 (86.5)	881 (87.7)	0.325
Yes	602 (13.5)	124 (12.3)	
Do not know how to prepare			
No	4,069 (91.3)	941 (93.6)	0.014*
Yes	389 (8.7)	64 (6.4)	
Have not thought about it enough			
No	1,649 (37.0)	457 (45.5)	< 0.001 *
Yes	2,809 (63.0)	548 (54.5)	
Nothing would be effective			
No	4,301 (96.5)	955 (95.0)	0.029*
Yes	157 (3.5)	50 (5.0)	
Cost too much money			
No	4,120 (92.4)	885 (88.1)	< 0.001 *
Yes	338 (7.6)	120 (11.9)	
Takes too much time			
No	4,254 (95.4)	933 (92.8)	0.001*
Yes	204 (4.6)	72 (7.2)	
Do not want to think about it			
No	4,033 (90.5)	921 (91.6)	0.247
Yes	425 (9.5)	84 (8.4)	
Do not have room for an emergency kit			
No	4,330 (97.1)	968 (96.1)	0.104
Yes	129 (2.9)	39 (1.4)	

Note: * Statistically Significant

With regard to proper planning and appropriate levels of preparedness, tornadoes present unique challenges that cannot be anticipated. Table 5.42 demonstrates significant differences between respondents who had and who had not experienced a tornado. Those public respondents who had experienced a tornado were more prepared than those who had not experienced a tornado in terms of situational readiness. Factors contributing to the better level of preparedness included reliance on being self-sufficient during a disaster (the most common reason among both groups), 48.2% (1,333) to 45.1% (1,189) ($\chi^2 = 5$, df=1, $p=0.024$); having had prior emergency exposure, 37.5% (1,039) to 14.2% (374) ($\chi^2 = 382$, df=1, $p<0.001$); responsibility for children, 25.6% (709) to 20.2% (533) ($\chi^2 = 22$, df=1, $p<0.001$); responsibility for elderly/disabled persons, 7.7% (213) to 4.9% (128) ($\chi^2 = 18$, df=1, $p<0.001$); and residence in a high risk area, 4.5% (125) to 2.3% (62) ($\chi^2 = 19$, df=1, $p<0.001$).

Table 5.42 Public survey respondents' reasons for being well prepared for a tornado

Level of Preparedness (Q23)	**Experienced a Tornado (Q1)**		
	No	Yes	*p*-value
	n=2,640 *n* (%)	*n*=2,769 *n* (%)	
Live in a high risk area			
No	2,578 (97.7)	2,644 (95.5)	< 0.001 *
Yes	62 (2.3)	125 (4.5)	
Been through emergency before			
No	2,263 (85.8)	1,728 (62.5)	< 0.001 *
Yes	374 (14.2)	1,039 (37.5)	
Responsible for children			
No	2,103 (79.8)	2,058 (74.4)	< 0.001 *
Yes	533 (20.2)	709 (25.6)	
Responsible for elderly / disabled			
No	2,508 (95.1)	2,554 (92.3)	< 0.001 *
Yes	128 (4.9)	213 (7.7)	
The importance of being self-sufficient			
No	1,447 (54.9)	1,434 (51.8)	0.024 *
Yes	1,189 (45.1)	1,333 (48.2)	

Note: 385 (6.6%) missing, * Statistically Significant

Table 5.43 shows significant differences between respondents who had and who had not experienced a flood. Those public respondents who had experienced a flood were more prepared than those who had not experienced a flood in terms of situational preparedness due to the following: the most common response among both groups, reliance on being self-sufficient during a disaster, 60.4% (644) to 43.3% (1,878) (χ^2 =101, df=1, p<0.001); having had prior emergency exposure, 54.6% (582) to 19.2% (831) (χ^2 =557, df=1, p<0.001); responsibility for children, 28.6% (305) to 21.6% (937) (χ^2 =24, df=1, p<0.001); responsibility for elderly/disabled persons, 9.1% (97) to 5.6% (244) (χ^2 =17, df=1, p<0.001); and residence in a high risk area, 6.5% (69) to 2.7% (118) (χ^2 =36, df=1, p<0.001).

Table 5.43 Public survey respondents' reasons for being well prepared for a flood

Level of Preparedness (Q23)	Experienced a Flood (Q1)		
	No	Yes	*p*-value
	n= 4,340 *n* (%)	*n*= 1,069 *n* (%)	
Live in a high risk area			
No	4,222 (97.3)	1,000 (93.5)	< 0.001 *
Yes	118 (2.7)	69 (6.5)	
Been through emergency before			
No	3,507 (80.8)	484 (45.4)	< 0.001 *
Yes	831 (19.2)	582 (54.6)	
Am responsible for children			
No	3,400 (78.4)	761 (71.4)	< 0.001 *
Yes	937 (21.6)	305 (28.6)	
Am responsible for elderly / disable			
No	4,093 (94.4)	969 (90.9)	< 0.001 *
Yes	244 (5.6)	97 (9.1)	
I think it is important to be self-sufficient			
No	2,459 (56.7)	422 (39.6)	< 0.001 *
Yes	1,878 (43.3)	644 (60.4)	

Note: 385 (6.6%) missing,* Statistically Significant

Table 5.44 shows that there was no significant difference between the respondents who had and who did not have a community warning system, with reference to the following items: disaster supply kits for the home; disaster supply kits for the car; disaster supply kits for the office; family communication plan; identification of a family meeting location; practice of emergency drills at home; taking a first-aid class (the most common among both groups) and volunteerism for emergencies.

Table 5.44 Public respondents' preparedness activities (with a community warning system)

Level of Preparedness (Q19)	Community Warning System (Q6)		
	No	Yes	*p*-value
	n=1,024 *n* (%)	*n*= 3,417 *n* (%)	
Disaster Supply Kit for Home			
No	634 (62.8)	2,151 (63.9)	0.927
Yes	381 (37.2)	1,266 (37.1)	
Disaster Supply Kit for Car			
No	765 (74.7)	2,544 (74.5)	0.869
Yes	259 (25.3)	873 (25.5)	
Disaster Supply Kit for the Office			
No	963 (94.0)	3,160 (92.5)	0.089
Yes	61 (6.0)	257 (7.5)	
Communication Plan for Family			
No	782 (76.4)	2,624 (76.8)	0.778
Yes	242 (23.6)	793 (23.2)	
Identified Meeting Location for Family			
No	764 (74.6)	2,597 (76.0)	0.362
Yes	260 (25.4)	820 (24.0)	
Practiced Drills at Home			
No	951 (92.9)	3,141 (91.9)	0.323
Yes	73 (7.1)	276 (8.1)	
Taken a First Aid Class			
No	535 (52.2)	1,864 (54.6)	0.194
Yes	489 (47.8)	1,553 (45.5)	
Volunteered for Emergencies			
No	901 (88.0)	2,999 (87.8)	0.849
Yes	123 (12.0)	418 (12.2)	

Note: 1,353 (23.4%) missing

Table 5.45 shows no significant differences between the respondents who had and those who did not have a community warning system in the following preparedness categories: three-day supply of medicines; extra batteries; flashlight; three-day supply of water; three-day supply of food; first-aid kit; and standard AM/FM radio.

Table 5.45 Public respondents' items in disaster kits (with a community warning system)

Level of Preparedness (Public)(Q20)	**Community Warning System (Q6)**		
	No	Yes	*p*-value
	n=971 *n* (%)	*n*=3,192 *n* (%)	
Three (3) Day Supply of Medicines			
No	683 (70.3)	2,205 (69.1)	0.455
Yes	288 (29.7)	987 (30.9)	
Extra Batteries			
No	533 (54.8)	1,779 (55.7)	0.629
Yes	439 (45.2)	1,414 (44.3)	
Flashlight			
No	433 (45.6)	1,483 (46.4)	0.634
Yes	529 (54.5)	1,710 (53.6)	
Three (3) Day Supply of Water			
No	629 (64.4)	2,036 (63.8)	0.717
Yes	346 (35.6)	1,157 (36.2)	
Three (3) Day Supply of Food			
No	613 (63.1)	2,050 (64.2)	0.518
Yes	359 (36.9)	1,143 (35.8)	
First Aid Kit			
No	543 (55.9)	1,780 (55.7)	0.949
Yes	429 (44.1)	1,413 (44.3)	
Standard AM/FM Radio			
No	578 (59.5)	1,850 (57.9)	0.398
Yes	394 (40.5)	1,343 (42.1)	

Note: 1,631 (28.1%) missing

Table 5.46 shows that there was not a significant difference between respondents with or without a community warning system, in the following categories: thinking it unlikely that an emergency would happen where they live; lack of knowledge of how to prepare; insufficient planning or forethought; efforts would be ineffective; too costly; too time consuming; no desire to think about it; and lack of sufficient room for an emergency kit.

Table 5.46 Reasons given by public respondents, with a community warning system, for their lack of emergency preparedness

Level of Preparedness (Public) (Q22)	**Community Warning System (Q6)**		
	No	Yes	*p*-value
	n=1,020 *n* (%)	*n*=3,423 *n* (%)	
Do not think an emergency will happen here			
No	878 (86.1)	2,976 (86.9)	0.476
Yes	142 (13.9)	447 (13.1)	
Do not know how to prepare			
No	929 (91.1)	3,159 (92.3)	0.211
Yes	91 (8.9)	264 (7.7)	
Have not thought about it enough			
No	427 (41.9)	1,326 (38.7)	0.073
Yes	593 (58.1)	2,097 (61.3)	
Nothing would be effective			
No	977 (95.8)	3,299 (96.4)	0.382
Yes	43 (4.2)	124 (3.6)	
Cost too much money			
No	929 (91.1)	3,157 (92.2)	0.235
Yes	91 (8.9)	266 (7.8)	
Takes too much time			
No	965 (94.6)	3,257 (95.2)	0.484
Yes	55 (5.4)	166 (4.8)	
Do not want to think about it			
No	921 (90.3)	3,102 (90.6)	0.753
Yes	99 (9.7)	321 (9.4)	
Do not have room for an emergency kit			
No	966 (97.6)	3,319 (96.9)	0.284
Yes	25 (2.4)	106 (3.1)	

Note: 1,351 (23.3%) missing

Table 5.47 shows that there were no significant differences between the respondents who have or do not have a community warning system in the following areas: residence in a high risk area; having had prior emergency exposure; responsibility for children; responsibility for elderly/disabled persons; and reliance on being self-sufficient during a disaster.

Table 5.47 Public respondents' reasons for being well prepared (with a community warning system)

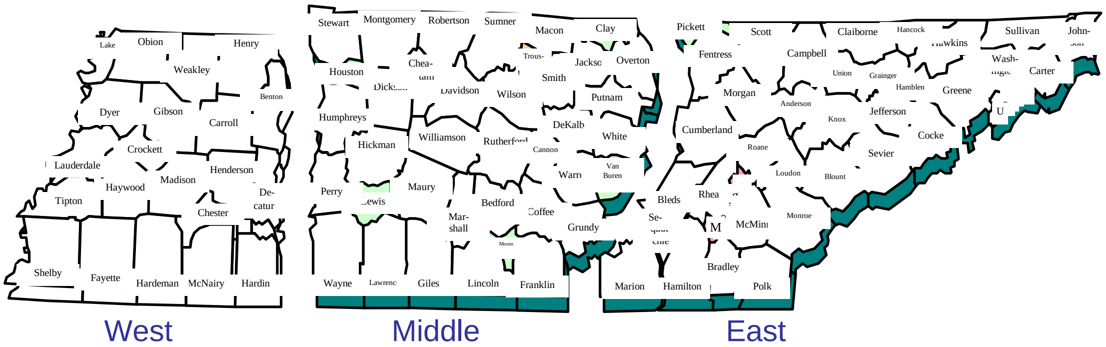
Level of Preparedness (Q23)	Community Warning System (Q6)		
	No *n*=1,024 *n* (%)	Yes *n*= 3,402 *n* (%)	*p*-value
Live in a high risk area			
No	987 (96.4)	3,283 (96.5)	0.861
Yes	37 (3.6)	119 (3.5)	
Been through emergency before			
No	726 (71.0)	2,492 (73.3)	0.135
Yes	297 (29.0)	906 (26.7)	
Am responsible for children			
No	786 (76.8)	2,590 (76.2)	0.697
Yes	237 (23.2)	807 (23.8)	
Am responsible for elderly / disabled			
No	953 (93.2)	3,184 (93.7)	0.512
Yes	70 (6.8)	213 (6.3)	
I think it is important to be self-sufficient			
No	546 (53.4)	1,787 (52.6)	0.667
Yes	477 (46.6)	1,610 (47.4)	

Note: 1,368 (23.6%) missing

5.2.2 Broadcast Media –

Sixty percent (21) of the 35 television stations and 18% (45) of the 250 radio stations completed the 2010 broadcast media survey. The responses presented in this section correspond to the total number of respondents from television stations and radio stations. The tables reflect the valid total which was the total number of responses, excluding those that were missing or invalid.

Figure 5.1 – Broadcast Regions



Middle Tennessee provided the largest radio station response, where 48.8% (21) answered the broadcast media survey compared to 25.6% from both east and west Tennessee (Table 5.48). The largest response from television stations came from east Tennessee, with 57.1% (12) answering the survey to 28.6% (6) from middle Tennessee and 14.3% (3) from west Tennessee.

Table 5.48 Number of broadcast media organizations responses by region

Demographics (Media) (Q1A)	Radio	Television	p-value
	n= 43 *n* (%)	*n*= 21 *n* (%)	
West	11 (25.6)	3 (14.3)	0.047
Middle	21 (48.8)	6 (28.6)	
East	11 (25.6)	12 (57.1)	

Note: 2 (4.4%) missing from the radio stations

A majority of the television stations were staffed 24 hours a day, seven days a week, whilst most of the radio stations were staffed during the daytime hours. Table 5.49 shows that 84.2% (16) of the television stations were staffed 24 hours a day, seven days a week compared to 14% (6) of the radio stations (χ^2 =29, df=2, p<0.001). The study shows only 5.3% (1) television station was staffed during daytime hours compared to 55.8% (24) of the radio stations (χ^2 =29, df=2, p<0.001).

The ‘Other’ category consisted of the following responses: the station was staffed from 4:00 am – 9:00 pm; the station was staffed during daytime hours between the hours of 6:00 am to 7:00 pm; the station was staffed on Sundays from 8:00 am to 12:00 pm and most Saturday and Sunday afternoons; the station was staffed during daytime only, unless advised of a severe weather event; the station was staffed during the daytime with its sister station staffed at night; and the station was unmanned from 12:30 a.m. to 3:30 a.m.

Table 5.49 Hours of operation of broadcast media organizations

Demographics (Media) (Q6)	**Radio**	**Television**	
	***n*= 43** ***n* (%)**	***n*= 19** ***n* (%)**	**p-value**
24 / 7	6 (14.0)	16 (84.2)	<0.001
Daytime Only	24 (55.8)	1 (5.3)	
Other	13 (30.2)	2 (10.5)	

Note: 2 (4.4%) were missing from radio and 2 (9.5%) are missing from television.

5.2.2.1 Knowledge/Experience Level of Broadcast Media

This section reviews responses from the broadcast media to questions related to knowledge/experience level.

It was found that the majority of the television stations and radio stations have policies in place to address non-weather alerts. From the broadcast media survey, 81.8% (36) of the radio stations and 89.5% (17) of the television stations that responded to the broadcast media survey had policies and/or procedures in place for non-weather alerts, such as an Amber Alert (child abduction), and road conditions (traffic accident) (Table 5.50).

Table 5.50 Broadcast media personnels' knowledge of policy and/or procedures for non-weather to the general public (i.e., Amber Alerts, evacuations, etc.)

Knowledge / Experience (Media) (Q8)	**Radio**	**Television**	
	***n*= 44** ***n* (%)**	***n*= 19** ***n* (%)**	**p-value**
Yes	36 (81.8)	17 (89.5)	0.445

Note: 1 (2.2%) of the radio stations and 2 (9.5%) of the television stations were missing.

Television stations and radio stations trust emergency generators to keep stations operational during power outages. The survey responses indicated that 100.0% (19) of the broadcast television stations had access to emergency generators for a back-up power supply compared to only 65.9% (29) of the radio stations (χ^2 =9, df=1, p=0.004) (Table 5.51). When dependent on emergency generators, stations monitored their fuel consumption to determine when to contact the fuel supplier.

Table 5.51 Broadcast media organizations' access to emergency generators

Knowledge / Experience (Media) (Q9)	**Radio**	**Television**	
	***n*= 44** ***n* (%)**	***n*= 19** ***n* (%)**	**p-value**
Back-up Generator	29 (65.9)	19 (100.0)	0.004

Note: 1 (2.2%) of the radio stations and 2 (9.5%) of the television stations were missing in that they did not respond to this question.

There was a difference in the number of broadcast media respondents who stated they received advance notice about severe weather information from NOAA Weather Radio, 77.8% (35) of the radio stations compared to 52.4% (11) of the television stations (χ^2 =4, df=1, p=0.037) (Table 5.52). The respondents said that 37.8% (17) of the radio stations received advance notices from private internet providers compared to 28.6% (6) of the television stations. There were 24.4% (11) of the radio stations that participated on a conference call with local emergency management agencies (EMA) compared to 9.5% (2) of the television stations. Also, both television stations and radio stations received severe weather information from 'other' sources, such as in-house meteorologists, the internet, NOAA Weather Radio, local newscasters, the National Weather Service, the Weather Channel and the Weather Service International (WSI).

Table 5.52 Sources of information for providing advanced severe weather notice to broadcast media

Knowledge / Experience (Media) (Q10)	**Radio**	**Television**	
	***n*= 45** ***n* (%)**	***n*= 21** ***n* (%)**	**p-value**
No advance notice	1 (2.2)	0 (0.0)	0.491
NOAA Weather Radio	35 (77.8)	11 (52.4)	0.037
Private Internet	17 (37.8)	6 (28.6)	0.465
Government Internet	6 (13.3)	4 (19.0)	0.546
Conference Call with Local Emergency Management (EMA)	11 (24.4)	2 (9.5)	0.156
Other	11 (24.4)	12 (57.1)	0.009

Both television stations and radio stations had confidence in the National Weather Service to supply them with severe weather information for emergency alerts. The survey responses indicated that 91.1% (41) of the radio stations receive emergency alert information from the National Weather Service compared to 85.7% (18) of the television stations (Table 5.53). The study also shows that 44.4% (20) of the radio stations received emergency alert information from the local EMA/public safety agencies compared to 76.2% (16) of the television stations (p=0.016). The ‘Other’ category in Table 5.53 was summarised as consisting of the following: use of the Emergency Alert System (EAS); use of the Local Primary – 1 (LP-1) and Local Primary – 2 (LP-2); and use of Talk Radio Network (TRN).

Table 5.53 Origin of emergency alert information for broadcast media

Knowledge / Experience (Media) (Q11)	**Radio**	**Television**	
	***n*= 45** ***n* (%)**	***n*= 21** ***n* (%)**	**p-value**
National Weather Service	41 (91.1)	18 (85.7)	0.507
Local EMA / public safety agencies	20 (44.4)	16 (76.2)	0.016
Local television station	10 (22.2)	9 (42.9)	0.085
Other broadcast stations in the area	18 (40.0)	8 (38.1)	0.954
Web / internet	13 (28.9)	3 (14.3)	0.197
Weather spotter	2 (4.4)	4 (19.0)	0.055
Contract service	1 (2.2)	4 (19.0)	0.016
HAM Radio Operators	3 (6.7)	0 (0.0)	0.226
Other	2 (4.4)	1 (4.8)	0.833

A community’s warning system consisted of broadcast television, broadcast radio, NOAA Weather Radio and community warning sirens. As shown in Table 5.54, 82.2% (37) of the radio stations received severe weather warnings from broadcast radio compared to 71.4% (15) of the television stations. The study shows that 62.2% of the radio stations received severe weather warnings via the NOAA Weather Radio compared to 76.2% (16) of the television stations. The study shows that 55.6% (25) of the radio stations received severe weather warnings via broadcast television compared to 85.5% (18) of the television stations (p=0.017). The broadcast media respondents said 28.9% (13) of the radio stations used cellular phone applications for severe weather warnings compared to 47.6% (10) of the television stations. The ‘Other’ category indicated that text messaging services were provided for local area emergencies.

Table 5.54 Broadcast media personnels’ knowledge/experience of severe weather warning systems

Knowledge / Experience (Media) (Q12)	**Radio**	**Television**	
	***n*= 45 *n* (%)**	***n*= 21 *n* (%)**	**p-value**
Do not know	1 (2.2)	3 (14.3)	0.056
Broadcast radio	37 (82.2)	15 (71.4)	0.318
NOAA weather radio	28 (62.2)	16 (76.2)	0.262
Broadcast television	25 (55.6)	18 (85.7)	0.017
Siren system	24 (53.3)	9 (42.9)	0.428
Cell phone / text message	13 (28.9)	10 (47.6)	0.137
Internet / government	8 (17.8)	5 (23.8)	0.566
Hardwired telephone	6 (13.3)	2 (9.5)	0.659
Other	1 (2.2)	0 (0.0)	0.491

5.2.2.2 Level of Preparedness for Broadcast Media

This section examines the broadcast media’s response to questions related to the level of preparedness.

The survey revealed that 28.2% (11) of the radio stations met with local authorities about emergency alerting capabilities and plans within the last year compared to 18.8% (3) of the television stations. Whereas 30.8% (12) of the radio stations did not know the date of the latest meeting with emergency management compared to 56.3% (9) of the television stations (Table 5.55).

Table 5.55 Time interval between broadcast media and county emergency management preparedness meetings

Level of Preparedness (Media) (Q25)	**Radio** *n*= 39 *n* (%)	**Television** *n*= 16 *n* (%)	**p-value**
Do not know	12 (30.8)	9 (56.3)	0.528
Within the last 30 days	5 (12.8)	1 (6.2)	
Within the last 6 months	4 (10.3)	1 (6.2)	
Within the last year	11 (28.2)	3 (18.8)	
Other	7 (17.9)	2 (12.5)	

Note: 5 (11.1%) of radio stations and 5 (23.8%) of television stations were missing.

Disaster exercises allow those involved to test response capabilities. The study shows that 59.1% (26) of the radio stations had not participated in severe weather exercises compared to 57.1% (12) of the television stations, 11.4% (5) of the radio stations had participated in a table top exercise compared to 9.5% (2) of the television stations and 11.4% (5) of the radio stations had participated in severe weather full-scale exercises compared to 4.8% (1) of the television stations (Table 5.56).

Table 5.56 Broadcast media's personnel participation in severe weather exercises (table top, functional or full-scale)

Level of Preparedness (Media) (Q26)	**Radio** *n*= 44 *n* (%)	**Television** *n*= 21 *n* (%)	**p-value**
No	26 (59.1)	12 (57.1)	0.882
Yes, table top	5 (11.4)	2 (9.5)	0.823
Yes, functional	3 (6.8)	0 (0.0)	0.221
Yes, full-scale	5 (11.4)	1 (4.8)	0.390
Yes, other	4 (8.9)	1 (4.8)	0.555

Most television and radio stations throughout the state of Tennessee did not have sufficient capability to broadcast in any language other than English. The respondents to the broadcast media survey stated that 87.8% (36) of the radio stations did not have the ability to provide information in various native languages to non-English speaking populations within the viewing or listening area compared to 88.2% (15) of the television stations (Tables 5.57).

The ‘yes’ response in Table 5.57 reflected the ability of broadcast media to multi-language broadcast and samples of the non-English communication capabilities were brought out from the results of this study. One station indicated the necessity for multi-lingual newscasters and one station reported having a news person fluent in three languages, who on occasion, works with the Spanish radio station. Additionally, one station employs a newscaster raised in Greece, who speaks Greek, Portuguese and English who also translates upon request.

Table 5.57 Ability of the media to broadcast alerts/warnings in various languages

Level of Preparedness (Media) (Q27)	**Radio**	**Television**	
	***n*= 41** ***n* (%)**	***n*= 17** ***n* (%)**	**p-value**
Do not know	3 (7.3)	1 (5.9)	0.971
No	36 (87.8)	15 (88.2)	
Yes	2 (4.9)	1 (5.9)	

Note: 4 (8.8%) of radio stations and 4 (19.0%) of television stations were missing.

5.2.2.3 Perceived Risk of Broadcast Media

This section reviews the broadcast media’s responses to questions related to the perceived risk associated with disasters.

Establishing triggers to disseminate information to the public was felt to be one way to improve the timeliness and accuracy of severe weather alerts/warnings. There was a significant difference in the number of responses from 71.4% (15) of the television stations who used severe weather watches issued by the Storm Prediction Centre as triggers compared to 31.1% (14) of the radio stations (χ^2 =9, df=1, p=0.002) (Tables 5.58). There was little change between radio and television in the following areas: stations were triggered to alert the public about severe weather warnings issued by the National Weather Service; and ‘when a tornado had been spotted in the viewing/listening area’.

The ‘Other’ category in Table 5.58 provided additional examples of severe weather triggers: Storm Prediction Centre’s outlook; direct contact from EMA office live; the discretion of the in-house meteorologists; use of NOAA weather radio; use of Weather Central; local police calls about severe weather in the area; local television partners switching to full-time live coverage for severe weather in the area; and determination by broadcast media to simulcast the broadcast over the air until the situation had improved.

Table 5.58 Severe weather alert triggers for broadcast media

Perceived Risk (Media) (Q13)	Radio *n*= 45 *n* (%)	Television *n*= 21 *n* (%)	p-value
When a severe weather warning is issued by the National Weather Service	43 (95.6)	18 (85.7)	0.159
When a tornado has been spotted in the viewing / listening area	24 (53.3)	14 (66.7)	0.307
When a severe weather watch is issued by the Storm Prediction Centre	14 (31.1)	15 (71.4)	0.002*
When the community alert siren system is activated by the emergency management agency	13 (28.9)	4 (19.0)	0.394
When your area is out looked for severe weather by the Storm Prediction Centre	7 (15.6)	8 (38.1)	0.042
Other	4 (8.9)	3 (14.3)	0.507

Note: * Statistically Significant

The majority of the television and radio stations sent out alerts during severe weather watches as frequently as needed. 86.0% (37) of the radio stations and 88.9% (16) of the television stations reported that alerts were broadcast to the general public as needed during a severe weather watch, as opposed to being on a timed schedule (Table 5.59). The 'Other' category indicated frequency of alerts: three (3) times an hour; approximately every 20 minutes on regular weather forecast; no broadcast of severe weather alerts; severe weather alerts triggered automatically as provided by NWS; and the station providing continuous alerting depending on the type of weather watch activated.

Table 5.59 Frequency of alert messages during a severe weather watch

Perceived Risk (Media) (Q15)	Radio *n*= 43 *n* (%)	Television *n*= 18 *n* (%)	p-value
Once an hour	0 (0.0)	0 (0.0)	0.882
Twice an hour	0 (0.0)	0 (0.0)	
Four times an hour	4 (9.3)	1 (5.6)	
As needed	37 (86.0)	16 (88.9)	
Other	2 (4.7)	1 (5.6)	

A majority of the television and radio stations sent out severe weather warnings as frequently as needed. Eighty six percent (37) of the radio stations compared to 75% (15) of the television stations reported that severe weather warning alerts were also broadcast to the general public as needed during a severe weather event (Table 5.60).

The 'Other' category shows further means of communicating severe weather warnings: automatic alerts as provided by NWS; continuous warnings through crawls; continuous display of county maps during a severe weather watch; placing a crawl on the bottom of the television screen every 15 minutes or upon arrival of updated information; announcements after every song or constantly if conditions warranted, continuing until the warning had been called off; and providing wall to wall coverage until the system passed through, dependent on severity of weather.

Table 5.60 Frequency of alert messages during a severe weather warning

Perceived Risk (Media) (Q17)	**Radio** ***n*= 43** ***n* (%)**	**Television** ***n*= 20** ***n* (%)**	**p-value**
Once an hour	0 (0.0)	0 (0.0)	0.142
Twice an hour	0 (0.0)	0 (0.0)	
Four times an hour	4 (9.3)	1 (5.0)	
As needed	37 (86.0)	15 (75.0)	
Other	2 (4.7)	4 (20.0)	

Table 5.61 shows that 93.2% (41) of the radio stations reported that cancellation of a severe weather warning to the viewing and listening audience occurred when the National Weather Service severe weather warning expired or was cancelled compared to 84.2% (16) of the television stations. Neither television

stations nor radio stations selected the categories, ‘Do not know,’ or ‘When the rain stops.’ 4.5% (2) of the radio stations selected ‘Upon notification from local emergency management/other public safety agencies.’

Various responses were provided in reference to the ‘Other’ component of Table 5.61. Supplemental statements offered in this category regarding cancellation or expiration of severe weather alerts by broadcast media reflected instances of station notification by the NWS of the expiration: receipt of the ‘all clear announcement’; use of weather crawls through the duration of the watch/warning to advise of current status and determination made by broadcast meteorologists to cancel the severe weather alert.

Table 5.61 Reasons for cancellation or expiration (‘all clear’ status) of severe weather alerts by broadcast media

Perceived Risk (Media) (Q18)	**Radio**	**Television**	
	***n*= 44 *n* (%)**	***n*= 19 *n* (%)**	**p-value**
Do not know	0 (0.0)	0 (0.0)	0.091
When the National Weather Service severe weather warning expires or is cancelled	41 (93.2)	16 (84.2)	
Upon notification from local emergency management / other public safety agency	2 (4.5)	0 (0.0)	
When the rain stops	0 (0.0)	0 (0.0)	
Other	1 (2.3)	3 (15.8)	

5.2.2.4 Alert/Notification Communication Strategy by Broadcast Media

This section reviews the findings from the broadcast media survey related to emergency alerts/notifications.

As indicated in Table 5.62, the study reflects a significant difference in the manner in which broadcast media receive emergency alerts and notifications. News departments and weather centres were shown to be the primary receivers of local emergency information by the majority of television stations. The respondents stated that 66.7% (14) of the television stations received local emergency alerts via the ‘news departments’ compared to 33.3% (15) of the radio stations (χ^2 =6, df=1, p=0.011). Radio stations were more likely to receive information through general staff announcements, 68.9% (31) compared to 14.3% (3) of television stations (χ^2 =17, df=1, p<0.001). There was a significant difference in broadcast medias usage of the ‘weather centre’ to receive local emergency alerts, with 57.1% (12) of the television stations compared to 13.3% (6) of the radio stations (Table 5.62) (χ^2 =14, df=1, p<0.001). The ‘Other’ categories in Table 5.62 included the use of: engineering staff; the station’s general manager; the station’s master controller; and on-air staff.

Table 5.62 Personnel receiving local emergency alerts on behalf of broadcast media originations

Communication (Media) (Q4)	**Radio**	**Television**	
	***n*= 45** ***n* (%)**	***n*= 21** ***n* (%)**	**p-value**
News Department	15 (33.3)	14 (66.7)	0.011
General Staff Announcement	31 (68.9)	3 (14.3)	<0.001*
Weather Centre	6 (13.3)	12 (57.1)	<0.001*
Other	3 (6.7)	3 (14.3)	0.805

Note: * Statistically Significant

Management of the majority of television stations stated that the news department and weather centre relayed information about local emergency alerts to the public. The management of radio station respondents indicated that the general staff transmitted local emergency alerts to the public (Table 5.63). There was a significant difference in the manner broadcast media relayed severe weather information to the public in the following areas: 71.1% (32) of the radio stations used General Staff Announcements to relay local emergency alerts compared to 19.0% (4) of the television stations (χ^2 =16, df=1, p<0.001); 24.4% (11) of the radio stations relied on news departments to relay local emergency alerts compared to 71.4% (15) of the television stations (χ^2 =13, df=1, p<0.001); and 4.4% (2) of the radio stations used Weather Centre, to relay local emergency alerts compared to 66.7% (14) of the television stations (χ^2 =30, df=1, p<0.001). There was no significant difference noted, however, in the proportions of broadcast radio stations and broadcast television stations that use the Emergency Alert System (EAS).

Included in the ‘Other’ category in Table 5.63 are the use of broadcast media announcers, the station’s general manager and the station’s master controller.

Table 5.63 Personnel who transmit information to the public about local emergency alerts

Communication (Media) (Q5)	Radio	Television	
	n= 45 *n* (%)	*n*= 21 *n* (%)	p-value
Emergency Alert System (EAS)	33 (73.3)	17 (81.0)	0.501
General Staff Announcement	32 (71.1)	4 (19.0)	<0.001*
News Department	11 (24.4)	15 (71.4)	<0.001*
Weather Centre	2 (4.4)	14 (66.7)	<0.001*
Other	2 (4.4)	4 (19.0)	0.055

Note: * Statistically Significant

A majority of the radio stations had the ability to bring in staff as needed. A majority of the television stations were staffed 24 hours a day for seven days. The media stations indicated that 71.1% (32) of the radio stations had the capability to interrupt pre-recorded broadcasting with severe weather information compared to only 9.5% (2) of the television stations. The survey demonstrated a significant difference in that 66.7% (30) of the radio stations reported the ability to bring in additional staff as needed compared to 9.5% (2) of the television stations (χ^2 =22, df=1, p<0.001) (Table 5.64).

Various responses were offered with regard to strategies employed by those who selected the ‘Other’ category in Table 5.64, including having plans in place to bring staff in to monitor severe weather events. One station reported too few staff members; one station having the general Emergency Alerting System (EAS) automatically interrupt the scheduled broadcast to transmit the warning in real time (without delay); usage by one station of internet connections to provide severe weather updates; one station has severe weather monitoring controlled by a central station; and one station’s receipt of notification of severe weather events from police station personnel.

Table 5.64 Capability to receive/disseminate severe weather alerts by broadcast media when stations were unstaffed

Communication (Media) (Q7)	**Radio**	**Television**	
	***n*= 45** ***n* (%)**	***n*= 21** ***n* (%)**	***P values***
Do not know	0 (0.0)	0 (0.0)	
Have the capability to interrupt recorded broadcasting with severe weather information	32 (71.1)	2 (9.5)	0.327
Have the ability to bring in staff as needed	30 (66.7)	2 (9.5)	< 0.001*
Do not have the capability to interrupt recorded broadcasting	2 (4.4)	0 (0.0)	< 0.001*
Not applicable	4 (8.9)	14 (66.7)	< 0.001*
Other	4 (8.9)	2 (9.5)	0.993

Note: * Statistically Significant

A majority of the television stations in Table 5.65 used news/weather reports to convey severe weather watch information to the public. The study shows a significant difference in the manner of issuance by broadcast media of severe weather watch notifications: 77.8% (35) of the radio stations used general staff announcements/on-air personalities to report severe weather watch information to the public compared to 28.6% (6) of the television stations (χ^2 =15, df=1, p<0.001). The responses indicated that 75.6% (34) of the radio stations broadcast severe weather watches to the general public using news/weather reports compared to 71.4% (15) of the television stations. The survey shows that 62.2% (28) of the radio stations used information from the NOAA Weather Radio to broadcast to the general public compared to 33.3% (7) of the television stations. Of the television stations, 76.2% (16) used crawlers on the bottom of the television screen. Some of the radio station respondents indicated use of closed captioning and crawlers on the bottom of the television. However, the question must have been misunderstood, as this was not possible on a radio.

The ‘Other’ means to inform the public included: display by the station of county maps of the affected areas; internet streams provided by the station; use of live cut-ins and/or simulcast of the local television station partners; communication of a NWS tornado watch by the station to the listening audience; live updates provided by the station from the public about severe weather; use of text messaging and email alerting system; severe weather updates provided on station websites; and collaboration of the station with local cable channels to display video information.

Table 5.65 Methods used by broadcast media to inform the public of severe weather watches

Communication (Media) (Q14)	**Radio**	**Television**	
	***n*= 45** ***n* (%)**	***n*= 21** ***n* (%)**	**p-value**
No announcement	2 (4.4)	1 (4.8)	0.954
News / weather reports	34 (75.6)	15 (71.4)	0.721
General staff announcement / on-air personalities	35 (77.8)	6 (28.6)	< 0.001*
NOAA weather radio	28 (62.2)	7 (33.3)	0.029
Crawler on the bottom of the television	3 (6.7)	16 (76.2)	< 0.001*
Closed captioning	1 (2.2)	7 (33.3)	< 0.001*
Civil authority	4 (8.9)	0 (0.0)	0.159
Other	6 (13.3)	2 (9.5)	0.659

Note: * Statistically Significant

A majority of the television stations used news/weather reports and crawlers on the bottom of the television screen to display severe weather warning information to the public. Radio stations, however, used news/weather reports and general staff announcements/on-air personalities to inform the public of severe weather information. The respondents indicated that 80.0% (36) of the radio stations received the general public alerts/warnings from news/weather reports compared to 76.2% (16) of the television stations. During the 2010 broadcast media survey 80.0% (36) of the radio stations received severe weather warnings to the public via NOAA Weather Radio compared to 47.6% (10) of the television stations. Of the television stations, 85.7% (18) used crawlers across the bottom of the screen to convey severe weather information, whilst one radio station indicated use of closed captioning and crawlers on the bottom of the television. As previously noted, it is not possible for a radio station to broadcast closed captioning, nor to use crawlers. It would appear this response was an error. There was a significant difference in the way broadcast media provided severe weather warning notification. 80.0% (36) of the radio stations said that alerts/warnings would come from general staff announcements compared to 38.1% (8) of the television stations (χ^2 =11, df=1, p=0.001) (Table 5.66).

The ‘Other’ means of relaying messages to the public by broadcast media included such options as: running a direct feed of the live weather coverage from a partner television station; the use of a crawl on bottom of television screens with interruption of programming with news/WX alerts as needed; the use of internet streams during severe weather events; the use of live cut-ins and/or simulcast of local television station partners’ severe weather event updates provided by the station on its website; text messaging and email alerts sent to the general public; and access to local cable channels.

Table 5.66 Methods used by broadcast media to inform the public of severe weather warnings

Communication (Media) (Q16)	Radio *n*= 45 *n* (%)	Television *n*= 21 *n* (%)	p-value
No announcement	0 (0.0)	0 (0.0)	
News / weather reports	36 (80.0)	16 (76.2)	0.724
NOAA weather radio	36 (80.0)	10 (47.6)	0.008
Crawler on the bottom of the television	3 (6.7)	18 (85.7)	< 0.001*
General staff announcement / on-air personalities	36 (80.0)	8 (38.1)	0.001*
Closed captioning	1 (2.2)	11 (52.4)	< 0.001*
Civil authority	6 (13.3)	0 (0.0)	0.079
Other	4 (8.9)	2 (9.5)	0.933

Note: * Statistically Significant

With the advancement in radar technology, weekly conference calls and National Weather Service emails, most of the respondents were at least somewhat satisfied with the information they received from the National Weather Service. As Table 5.67 shows, 61.0% (25) of the radio stations were very satisfied with the information provided by the National Weather Service compared to 42.1% (8) of the television stations (χ^2 =8, df=3, p=0.049).

Table 5.67 Forecast information provided by the National Weather Service (NWS) to broadcast media

Communication (Media)(Q19)	Radio *n*= 41 *n* (%)	Television *n*= 19 *n* (%)	p-value
Very Satisfied	25 (61.0)	8 (42.1)	0.049
Somewhat Satisfied	15 (36.6)	8 (42.1)	
Not Satisfied	1 (2.4)	0 (0.0)	
Don't Know	0 (0.0)	3 (15.8)	

Note: 4 (8.8%) of the radio stations and 2 (9.5%) of the television stations were missing.

The study shows that a majority of the respondents were at least somewhat satisfied that the National Weather Service provided information in a timely manner (Table 5.68). The more quickly news stations were in receipt of this information, the faster they were able to relay the information to the public and to response agencies. 68.3% (28) of the radio stations were very satisfied compared to 52.6% (10) of the television stations. The respondents indicated that 29.3% (12) of the radio stations were somewhat satisfied compared to 31.6% (6) of the television stations (χ^2 =7, df=3, p=0.059).

Table 5.68 Timeliness of severe weather information provided by the National Weather Service (NWS) to broadcast media

Communication (Media) (Q19)	**Radio** *n*= 41 *n* (%)	**Television** *n*= 19 *n* (%)	**p-value**
Very Satisfied	28 (68.3)	10 (52.6)	0.059
Somewhat Satisfied	12 (29.3)	6 (31.6)	
Not Satisfied	1 (2.4)	0 (0.0)	
Don’t Know	0 (0.0)	3 (15.8)	

Note: 4 (8.8%) of the radio stations and 2 (9.5%) of the television stations were missing.

When severe weather threatened, it was vital that accurate information be released to the public and to response agencies. Sixty one percent (25) of the radio stations were very satisfied with the accuracy of the severe weather information they received from the National Weather Service compared to 36.8% (7) of the television stations (Table 5.69). The study shows that 34.1% (14) of the radio stations were somewhat satisfied with the accuracy of severe weather information from the National Weather Service compared to 47.4% (9) of the television stations (χ^2 =9, df=3, p=0.024).

Table 5.69 Accuracy of severe weather information provided by the National Weather Service (NWS) to broadcast media

Communication (Media) (Q19)	**Radio**	**Television**	
	***n*= 41** ***n* (%)**	***n*= 19** ***n* (%)**	**p-value**
Very Satisfied	25 (61.0)	7 (36.8)	0.024
Somewhat Satisfied	14 (34.1)	9 (47.4)	
Not Satisfied	2 (4.9)	0 (0.0)	
Don't Know	0 (0.0)	3 (15.8)	

Note: 4 (8.8%) of the radio stations and 2 (9.5%) of the television stations were missing.

A majority of the respondents stated that the weather forecast during the last five years had become more accurate. Table 5.70 shows that 38.1% (16) of the radio stations reported the weather forecast during the last five year period had become increasingly accurate compared to 22.2% (4) of the television stations. The study shows that 42.9% (18) of the radio stations stated that the weather forecast over the last five years had become somewhat more accurate compared to 66.7% (12) of the television stations.

Table 5.70 Opinion of broadcast media regarding accuracy of the weather forecast provided during the last five years by the National Weather Service (NWS)

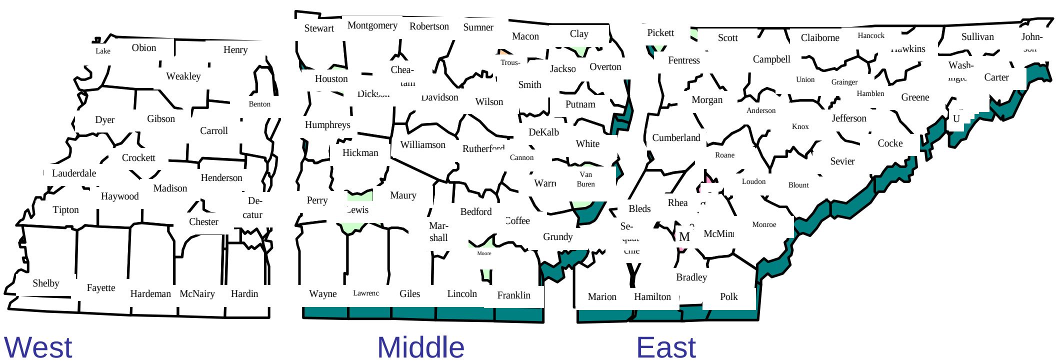
Communication (Media) (Q20)	**Radio**	**Television**	
	***n*= 42** ***n* (%)**	***n*= 18** ***n* (%)**	**p-value**
A lot more accurate	16 (38.1)	4 (22.2)	0.504
A little more accurate	18 (42.9)	12 (66.7)	
Has stayed the same	6 (14.3)	2 (11.1)	
A little less accurate	1 (2.4)	0 (0.0)	
A lot less accurate	1 (2.4)	0 (0.0)	

Note: 3 (6.6%) of the radio stations and 3 (14.2%) of the television stations were missing.

5.2.3 Emergency Management

The state of Tennessee comprises 95 counties in total. The eastern region consists of 21 counties, the middle region consists of 38 counties, and the western region consists of 36 counties. From a total of 95 county emergency managers, 96.8% (92) completed the emergency management survey. The tables reflect the valid total i.e. the total number of responses excluding those that were missing or invalid.

Figure 5.2 TEMA Regions



The study shows that 87.2% (68) of the county emergency managers were paid positions, whilst 12.8% (10) were volunteers (Table 5.71). There were no significant differences between regions.

Table 5.71 Number of county emergency managers responding by region

Demographics (EMA) (Q6A)	West *n*= 20 *n* (%)	Middle *n*= 27 *n* (%)	East *n*= 31 *n* (%)	Total *n*= 78 *n* (%)	p-value
Paid	19 (95.0)	21 (77.8)	28 (90.3)	68 (87.2)	0.173
Volunteer	1 (5.0)	6 (22.2)	3 (9.7)	10 (12.8)	

Note: 14 (15.2%) missing

When asked how agencies were staffed, county emergency managers described the agencies across the state as approximately evenly divided between the options available, with: 34.1% (28) being staffed 24 hours a day, seven days a week; 29.3% (24) being staffed during daytime only; 36.6% (30) having ‘other’ variations (Table 5.72).

The ‘Other’ category summarised alternate means of staffing the county emergency management agencies as follows: working of normal business hours (9:00 am to 4:00 pm); availability when duty calls; voluntary basis only and part-time positions.

Table 5.72 Hours of operation of the county emergency management agencies

Demographics (EMA) (Q7)	***n*= 82 *n* (%)**
24 / 7	28 (34.1)
Daytime Only	24 (29.3)
Other	30 (36.6)

Throughout the state of Tennessee, 63.1% (53) of the county emergency management agencies had only one or two staff members (Table 5.73). The county emergency management agency staffing under ‘Other’ was as follows: a paid director and nineteen volunteers; two full-time and two part time; forty volunteers; one paid part-time and five volunteer staff members; the director being the only paid position; a volunteer assistant director and seven volunteers; two part-time positions; and volunteers only.

Table 5.73 Staffing levels of county emergency management agencies

Demographics (EMA) (Q8)	***n*= 84** ***n* (%)**
1 – 2	53 (63.1)
3 – 4	14 (16.7)
5 – 6	4 (4.8)
7 +	3 (3.6)
Other	10(11.9)

5.2.3.1 Knowledge/Experience Level of Emergency Management

This section examines the emergency management responses related to knowledge/experience levels.

Table 5.74 shows that 73.3% (63) of the county emergency management agencies had a non-weather alert policy and/or procedure in place. Examples of non-weather emergencies were: Amber Alerts, evacuations alerts, fire alerts and hazardous materials alerts.

Table 5.74 Knowledge of policy and/or procedures for non-weather events (i.e., Amber Alerts, evacuations, etc.) by county emergency management agencies

Knowledge / Experience (EMA) (Q 9)	***n*= 86** ***n* (%)**
Yes	63 (73.3)

Note: 6 (6.5%) missing

A majority, 84.9% (73), of the county emergency management agencies had emergency operations centres with emergency generator back-up (Table 5.75).

Table 5.75 Use of emergency generators for the county emergency operations centre (EOC)

Knowledge / Experience (EMA) (Q10)	***n*= 86 *n* (%)**
Do not have an Emergency Operations Centre (EOC)	7 (8.1)
No	6 (7.0)
Yes	73 (84.9)

Note: 6 (6.5%) missing

The survey establishes that 93.0% (80) of the county emergency management agencies received severe weather information from the National Weather Service (Table 5.76) whilst 76.5% (65) of the respondents used a conference call system with the State Emergency Management Agency (Tennessee State Emergency Management Agency [TEMA])/National Weather Service (NWS). The study shows that 73.8% (62) of the respondents used NOAA Weather Radios, 69.8% (60) of the respondents used local broadcast television stations and 65.1% (56) of the respondents used the State Emergency Management Agencies/Tennessee Emergency Management Agency (TEMA).

The ‘Other’ sources of information for county emergency management agencies were: cell phone text alerts, National Warning System (NAWAS) and National Crime Information Centre (NCIC) Teletype; the use of the Emergency Managers Weather Information Network (EMWIN); the use of the Alert FM system; the use of HAM radio operators; the use of weather spotters; working with local meteorologists; working with the National Weather Service; and receiving text message updates from The Weather Channel.

Table 5.76 Origin of emergency information for county emergency management agencies

Knowledge / Experience (EMA) (Q11)	***n*= 86 *n* (%)**
No advance notice	1 (1.2)
National Weather Service (NWS)	80 (93.0)
Conference Call with State Emergency Management Agency / National Weather Service (NWS)	65 (76.5)
NOAA Weather Radio / Emergency Alert System (EAS)	62 (73.8)
Local Broadcast Television Station	60 (69.8)
State Emergency Operations Centre / TEMA	56 (65.1)
Local Broadcast Radio Station	38 (44.7)
Internet Private	36 (41.9)
Internet Government	19 (22.1)
N/A	0 (0.0)
Other	8 (9.3)

Note: 6 (6.5%) missing

The emergency management survey found that severe weather alert information originated from the following areas: 97.6% (82) from the National Weather Service (NWS); 52.3% (45) from the State Emergency Management Agency/TEMA; 43.5% (37) from weather spotters; 41.2% (35) from local broadcast television stations and 27.9% (24) from local broadcast radio stations (Table 5.77).

The ‘Other’ sources of information for county emergency management agencies were: 911 dispatch centres; citizens; text messages to the weather spotters; Alert FM from NWS; industrial partners; private sector partners; other community members; local meteorologists; and the Nashville Metro Office of Emergency Management.

Table 5.77 Origin of emergency alert information for county emergency management agencies

Knowledge / Experience (EMA) (Q12)	***n*= 86 *n* (%)**
National Weather Service	82 (97.6)
State EMA	45 (52.3)
Weather spotter	37 (43.5)
Local broadcast television station	35 (41.2)
HAM radio operators	28 (32.9)
Web / internet	26 (30.2)
Local broadcast radio station	24 (27.9)
Contract service	6 (7.0)
Other	5 (5.8)

Note: 6 (6.5%) missing

In reviewing existing warning systems, 76.7% (66) of the emergency managers believed that the general public received weather warnings via the NOAA weather radio, 74.4% (64) via broadcast radio stations, 54.8% (46) via broadcast television and 52.3% (45) by siren systems (Table 5.78). The survey also indicated that 50.0% (43) of the emergency managers thought the public received alerts either by cell phone/text messages.

The 'Other' category revealed that county emergency management agencies believed the public preferred the following community warning systems for alerts/warnings: 36 TVA sirens; community sirens; Alert FM; voice pagers; 911 centre by way of scanners; cable over-ride; reverse 911; social media; and dispatch centre.

Table 5.78 Existing components of a community alert/warning system

Knowledge / Experience (EMA)(Q13)	***n*= 86** ***n* (%)**
Do not know	0 (0.0)
NOAA weather radio	66 (76.7)
Broadcast radio	64 (74.4)
Broadcast television	46 (54.8)
Siren system	45 (52.3)
Cell phone / text messaging	43 (50.0)
Hardwired telephone	28 (32.6)
Internet / government	19 (22.1)
Other	23 (26.7)

Note: 6 (6.5%) missing

As indicated in Table 5.79, county emergency managers utilise severe weather alerts/warnings to reach the public in multiple ways. The respondents to the emergency management agency (EMA) survey indicated compliance in seeking assistance from the following outside agencies to notify the general public regarding severe weather emergencies: 86.0% (74) specified contacting the county 911 communication centres; 79.1% (68) expressed reliance on local law enforcement; 72.1% (62) expressed dependence on fire departments; and 60.5% (52) received assistance from HAM radio operators.

The ‘Other’ category described additional sources of information for the general public including: Alert FM; Community Emergency Response Team (CERT) members; news media and radio; NOAA Weather Radio; and the county school system.

Table 5.79 Agencies available to assist the county emergency management agency in the notification of severe weather emergencies

Knowledge /Experience (EMA) (Q17)	***n*= 86 *n* (%)**
County 911	74 (86.0)
Local law enforcement	68 (79.1)
Fire department	62 (72.1)
HAM radio operators	52 (60.5)
Weather spotters	46 (53.5)
State emergency management	45 (52.3)
Emergency medical services	35 (40.7)
County senior elected official	17 (19.8)
State law enforcement	13 (15.1)
N /A	1 (1.2)
All other responses	6 (7.0)

Note: 6 (6.5%) missing

5.2.3.2 Level of Preparedness of Emergency Management

This section reviews the emergency management survey respondents' opinions of the level of preparedness of a given population.

The survey revealed that 35.4% (28) of the emergency managers had met with local broadcast television/radio stations in the area about emergency alerting capabilities/plans within the last year. Conversely, 25.3% (20) of the respondents did not know the last time they met with the media (Table 5.80).

Included in 'Other' responses of county emergency management agencies regarding meeting with broadcast media about alerting capabilities and plans were: never having met with broadcast media about planning; no local television or radio in the county; and an interval of more than two years since the last meeting.

Table 5.80 Time interval since planning meeting between county emergency management agencies and broadcast media

Level of Preparedness (EMA) (Q30)	***n*= 79 *n* (%)**
Within the last 30 days	6 (7.6)
Within the last 6 months	13 (16.5)
Within the last year	28 (35.4)
Other	12 (15.2)
Do not know	20 (25.3)

Note: 13 (14.1%) missing

As Table 5.81 shows, the emergency management survey established that 53.6% (45) of the respondents had zero broadcast media involvement in severe weather exercises. Among those with such involvement, the most common type of exercise related to terrorism.

The ‘Other’ category, regarding the county emergency management agencies involving broadcast media in severe weather exercises, consisted of the following responses: broadcast media had never participated in a severe weather exercise; had participated in a discussion group for the media; broadcast media received experience and training during an actual event; the news media provided local information during exercises; local broadcast media had never been involved in exercises; local broadcast media were involved in planning and implementation of warnings.

Table 5.81 Broadcast media's personnel participation in severe weather exercises (table top, functional or full-scale)

Level of Preparedness (EMA) (Q31)	***n*= 84 *n* (%)**
No	45 (53.6)
Yes, table top	21 (25.0)
Yes, functional	16 (19.0)
Yes, full scale	7 (8.3)
Yes, other	7 (8.3)

Note: 8 (8.7%) missing

Table 5.82 indicates planning methods by which county emergency management agencies addressed the special needs/vulnerable populations with regard to severe weather events. The most common areas addressed were that 67.5% (54) identification of shelter facilities with the appropriate support services and 57.5% (46) identification of necessary resources for transportation and evacuation.

Table 5.82 Disaster planning developed for special needs/vulnerable populations by county emergency management agencies

Level of Preparedness (EMA) (Q32)	***n*= 80** ***n* (%)**
Identified shelter facilities with appropriate support services	54 (67.5)
Identified necessary resources needed for transportation and evacuation	46 (57.5)
Status checks on elderly and disabled persons living alone that may be at risk (pre- and post-incident	35 (43.8)
Understand the resource and cultural needs of the given population	33 (41.3)
Establish communication networks with caregivers for delivering disaster / severe weather notifications and alerts	30 (37.0)
Provide essential conduits for distribution of disaster preparedness / severe weather information	28 (35.0)
Establish “Registry” for the special needs / vulnerable populations	25 (31.3)

Note: 12 (13.0%) missing

The emergency management survey shows that 36.0% (18) of the respondents engaged with community stakeholders and assisted them with the non-English speaking community (Table 5.83). The survey also found that 26.5% (13) of the respondents provided disaster/severe weather information in various languages.

A sample list of disaster preparedness materials and resources provided by county emergency management agencies that were available to the non-English speaking community included brochures for the Hispanic community regarding severe weather emergency procedures.

Table 5.83 Capabilities to provide broadcast alerts/warnings in various languages

Level of Preparedness (EMA) (Q33)	***n*= 49** ***n* (%)**
Engaged community stakeholders (local television stations, radio stations)	18 (36.0)
Provided disaster / severe weather information in various languages	13 (26.5)
Identified information sites in area neighbourhoods to assist in building relationships and social networks with population-based groups.	10 (20.4)
Provided technical assistance to leaders of non-English speaking community?	8 (16.3)

Note: 43 (46.7%) missing

5.2.3.3 Perceived Risk of Emergency Management

This section reviews the emergency management survey responses to perceived risk.

Severe weather triggers assisted county emergency managers in preparation for severe weather events and helped improve resource management. The respondents explained that the following triggers were in place for severe weather events: 86% (74) received triggers when a severe weather warning was issued by the National Weather Service (NWS); 59.3% (51) received triggers when a tornado had been spotted in the area; 47.7% (41) received triggers when a severe weather watch was issued by the Storm Prediction Centre (Table 5.84).

County emergency management agencies cited various alternate severe weather triggers, included in the ‘Other’ category, as follows: receipt of direct emergency alerts from the Nashville Office of Emergency Management (OEM); usage of established alerting triggers determined by the civil authority; usage of established triggers as conditions warrant, or a potential threat to life and safety exists; reliance on a Central Dispatch System; collaboration with the National Weather Service and broadcast television services; EMA/government notification of the general public; reliance on local first response groups monitoring weather days in advance; usage of local media to assist with local alerts; utilisation of storm tracking with radar; and spotting of severe weather or tornadoes in counties which are between county emergency management and a severe weather system.

Table 5.84 Severe weather alert triggers for county emergency management agencies

Perceived Risk (EMA) (Q16)	***n*= 86** ***n* (%)**
When a severe weather warning is issued by the National Weather Service	74 (86.0)
When a tornado has been spotted in the area	51 (59.3)
When a severe weather watch is issued by the Storm Prediction Centre	41 (47.7)
When your area is given an outlook for severe weather by the Storm Prediction Centre	35 (40.7)
N/A	3 (3.5)
Other	12 (14.0)

Note: 6 (6.5%) missing

The emergency management survey found that 87.1% (74) of the respondents stated that a severe weather watch was broadcast to the general public on an “as needed” basis (Table 5.85). The ‘Other’ category relating to the frequency of a severe weather watch can be summarized by county emergency management agencies as follows: anytime and at the mercy of the media.

Table 5.85 Frequency of alert messages during a severe weather watch by county emergency management agencies

Perceived Risk (EMA)(Q19)	*n*= 85 *n* (%)
Every 60 minutes	1 (1.2)
Every 30 minutes	1 (1.2)
Every 15 minutes	1 (1.2)
Every 10 minutes	2 (2.4)
As needed	74 (87.1)
N / A	5 (5.9)
Other	1 (1.2)

Note: 7 (7.6%) missing

The study indicates that 84.9% (73) of respondents felt that severe weather warnings were broadcast to the general public as needed (Table 5.86).

Various 'Other' responses regarding severe weather warnings from county emergency management agencies included: discretion of the media; alerts are broadcast to the general public about severe weather warnings at any time; and activation of the community warning sirens upon issuance of a tornado warning, with activation every eight minutes thereafter during the warning period.

Table 5.86 Frequency of alert messages during a severe weather warning by county emergency management agencies

Perceived Risk (EMA) (Q21)	*n*= 86 *n* (%)
Every 60 minutes	2 (2.3)
Every 30 minutes	0 (0.0)
Every 15 minutes	3 (3.5)
Every 10 minutes	2 (2.3)
As needed	73 (84.9)
N / A	5 (5.8)
Other	1 (1.2)

Note: 6 (6.5%) missing

Table 5.87 shows that 83.3% (70) of the emergency management agencies communicated cancellation of a severe weather warning to the general public when they were given the' all clear' by the National Weather Service (NWS).

Included in 'Other' responses regarding the cancellation or expiration of severe weather alerts by county emergency management agencies were: lack of capability to cancel a severe weather alert; issuance of tornado warnings via community sirens during the duration of warning window; observation of radar from the NWS; and communication with the public by county emergency management agencies when all potential threats have ceased.

Table 5.87 Reasons for cancellation or expiration ('all clear' status) of severe weather alerts by county emergency management agencies

Perceived Risk (EMA) (Q22)	***n*= 84** ***n* (%)**
Do not know	3 (3.6)
When the National Weather Service severe weather warning expires	70 (83.3)
Upon notification from State Emergency Management / other public safety agency	1 (1.2)
When the rain stops	0 (0.0)
N / A	7 (8.3)
Other	3 (3.6)

Note: 8 (8.7%) missing

5.2.3.4 Alert/Notification Communication Strategy of Emergency Management

This section reviews the emergency management survey responses to the effectiveness of the existing emergency alert/notification capabilities.

Table 5.88 shows that 91.9% (79) of the county directors of emergency management agencies received information about local emergency alerts for their respective areas. The ‘Other’ category was selected by 45.3% (39) of the county emergency management agencies and indicated differences as follows: usage of a 24-hour warning point; receipt of information about local emergency alerts; usage of the 911 centre; having individuals signed up for Emergency Management Weather Information Network (EMWIN); notifications through the EMA Office; collaboration with other first-responder agency heads; receipt of alerts from public safety and first-responder command staff; receipt of alerts from sheriff’s department personnel; receipt of alerts from the local fire departments; receipt of alerts from the county school personnel; dissemination of information through NOAA Weather Radio Systems and media outlets; having Emergency Service Agencies signed up for dispatch page; collaboration with law enforcement officials; teaming with Public Works, Emergency Medical Services and various elected officials; collaboration with hospital personnel; receipt of alerts from the directors of schools; receipt of alerts from radio stations; utilization of NOAA Weather Radio/WDEB Radio Station; receipt of alerts from nursing home personnel; and receipt of alerts from amateur (HAM) radio operators.

Table 5.88 Personnel receiving local emergency alerts on behalf of the county emergency management agency

Communication (EMA)(Q3)	***n* = 86** ***n* (%)**
Director of the County Emergency Management Agency	79 (91.9)
Assistant Director of the County Emergency Management Agency	33 (38.4)
County Emergency Management Staff	31 (36.0)
County Senior Elected Officials	21 (24.4)
Other	39 (45.3)

Note: 6 (6.5%) missing

The emergency management survey shows that 83.7% (72) of the respondents reported that the County Directors of emergency management agencies relayed information about local emergency alerts to the broadcast media (Table 5.89). The respondents also stated that 53.5% (46) used NOAA Weather Radios to relay information about the local emergency alert to the broadcast media.

The 'Other' category regarding ways in which local alerts were relayed to broadcast media can be summarised as follows: utilization of a 24-hour warning point; reliance by county emergency managers on information from supporting locations, i.e., Crossville/Cumberland County Central Communication Centre; usage of the 911 Centre; usage of Alert FM; collaboration with the Director and/or Assistant Director of local 911 Communications Centre; utilization of Central Dispatch; usage of Emergency Management Weather Information Network (EMWIN); collaboration with local law enforcement; monitoring of public television and radio; usage of Reverse 911; reliance on Sheriff's Department; utilization of Tone Radio; assistance from storm spotters and other amateur clubs within the county; monitoring of weather information broadcast from various surrounding locations, i.e., Chattanooga; and reliance on weather information from broadcast media with updates received on a regular basis – with the exception made by one county emergency manager with regard to that particular county not being involved with local news media.

Table 5.89 Communication methods used for relaying local emergency alerts to broadcast media by the county emergency managers

Communication (EMA) (Q4)	***n*= 86** ***n* (%)**
Director of the County Emergency Management Agency	72 (83.7)
NOAA Weather Radio / Emergency Alert System (EAS)	46 (53.5)
Public Information Officer (PIO)	27 (31.4)
Assistant Director of the County Emergency Management Agency	20 (23.3)
County Emergency Management Staff	17 (19.8)
County Senior Elected Officials	16 (18.6)
N/A	1 (1.2)
Other	20 (23.3)

Note: 6 (6.5%) missing

Emergency managers indicate that 80.2% (69) of the respondents said that the Directors of Emergency Management disseminated information about the local emergency alert to the general public (Table 5.90). 65.1% (56) of the respondents said that NOAA Weather Radios relayed information about the local emergency alert to the general public.

Summarisation of the ‘Other’ category communication to the general public by county emergency management agencies is as follows: utilization of 911 with reverse 911 service; reliance on the 911 Centre; usage of local school systems’ automated hardwire; usage of local college automated text alert system; monitoring of local broadcast cable channels and broadcast radio stations; utilization of Alert FM ; assistance from the director and/or assistant director of local 911 Communications Centre; usage of the dispatch centre; utilization of the EMWIN (Emergency Management Weather Information Network); collaboration with law enforcement; reliance on information from local media; monitoring of television stations; use of and trust in the Office of Emergency Management (OEM) 24-hour operations officers; utilization of a radio station's central dispatch; and use of WDEB Radio Station (H.W. "Turk" Baz) County PI. (One exception to usage noted was an incidence with no one available in the county.)

Table 5.90 Communication methods used for relaying local emergency alert information to the public by county emergency manager

Communication (EMA) (Q5)	***n*= 86** ***n* (%)**
Don't Know	1 (1.2)
Director of the County Emergency Management Agency	69 (80.2)
NOAA Weather Radio / Emergency Alert System (EAS)	56 (65.1)
Assistant Director of the County Emergency Management Agency	24 (27.9)
County Emergency Management Staff	22 (25.6)
Public Information Office	19 (22.1)
County Senior Elected Official	19 (22.1)
Other	31 (36.0)

Note: 6 (6.5%) missing

Table 5.91 shows that in the case of a disaster impacting the community with a loss of power, survey respondents requested assistance from the following groups to assist in disseminating emergency information to the general public: 73.3% (63) requested assistance from local response agencies using public address systems within vehicles; 72.1% (62) requested assistance from broadcast radio stations; 58.1% (50) preferred use of face to face communication and 55.8% (48) indicated preference of word of mouth from neighbours, family and friends.

The ‘Other’ category regarding a back-up plan to provide emergency information to the public by county emergency management agencies included: the use of social media as a means of communication; assistance from the 911 Centre having a back-up system; Alert FM system; amateur radio; Cable Television (CATV); Twitter, Nixi and Facebook; central dispatch system; use of the Emergency Management Agency (EMA) website; use of firemen and other emergency services personnel for door to door monitoring of need for assistance; initiating with highest risk population first; use of local emergency communication points located across the county; use of the NOAA Weather Radio; Reverse 911 system; use of the text message alert system; and an alert tone from a scanner.

Table 5.91 County emergency management back-up plans to provide emergency information to the general public in the event of electrical failure

Communication (EMA)(Q14)	***n*= 86** ***n* (%)**
Local response agencies using public address system within the vehicles	63 (73.3)
Broadcast radio stations	62 (72.1)
Face-to-face communication	50 (58.1)
Word of mouth from neighbours, family and friends	48 (55.8)
Broadcast television stations	33 (38.4)
Newspaper	22 (25.6)
Other	16 (18.6)

Note: 6 (6.5%) missing

The emergency management survey responses indicated that 51.2% (42) of the participants expressed a high level of confidence in the local broadcast media’s ability to convey appropriate severe weather information to the general public (Table 5.92).

Table 5.92 County emergency management agencies' confidence in local broadcast media to convey appropriate severe weather message to the general public

Communication (EMA) (Q15)	***n*=82 *n* (%)**
Not Confident	5 (6.1)
Somewhat Confident	30 (36.6)
Very Confident	42 (51.2)
N /A	5 (6.1)

Note: 10 (10.9%) missing

The emergency managers were asked to state the manner in which a severe weather watch was communicated to the general public. Responses reflected were: 79.1% (68) communication via the National Weather Service; 74.4% (64) via the NOAA Weather Radio; 72.1% (62) via local broadcast radio stations and 60.5% (52) via local broadcast television stations (Table 5.93).

The 'Other' means used by county emergency management agencies to communicate severe weather watches to the general public included: 911 dispatch; Alert FM system; broadcast of messages on audible scanners; 911 Centre by way of scanner; Facebook; internet based call system from the 911 Centre; Nashville broadcast stations; local radio; Reverse 911 system; and city warning sirens.

Table 5.93 Methods of communication used by county emergency management agencies to alert the public about a severe weather watch

Communication (EMA) (Q18)	***n*= 86** ***n* (%)**
National Weather Service	68 (79.1)
NOAA weather radio / Emergency Alert System (EAS)	64 (74.4)
Local broadcast radio stations	62 (72.1)
Local broadcast television stations	52 (60.5)
Crawler on the bottom of the television screen	30 (34.9)
Text messages	29 (33.7)
HAM radio operators	27 (31.4)
Internet	22 (25.6)
Email	20 (23.3)
Television / government access	17 (19.8)
Mass telephone calls	16 (18.6)
Civil authority	7 (8.1)
Highway message boards	2 (2.3)
No announcement	2 (2.3)
Other	6 (7.0)

Note: 6 (6.5%) missing

The emergency managers were asked to state the manner in which severe weather warnings were communicated to the general public. Responses indicated that 82.6% (71) were communicated via local broadcast radio stations, 80.2% (69) via the National Weather Service, 79.1% (68) via the NOAA Weather Radio and 65.1% (56) via local broadcast television stations (Table 5.94).

The ‘Other’ category summarises methods of communication of severe weather warnings to the general public on the part of county emergency management agencies to include: notations that some counties are without local television stations or have a limited number of radio stations; some were included through coverage by the Nashville media; alerts dispatched through 911 for some; use of the FM Alert system; use of the 911 Centres; use of scanners; and use of an internet based call system.

Table 5.94 Methods of communication used by county emergency management agencies to alert the public about a severe weather warning

Communications (EMA) (Q20)	***n*= 86** ***n* (%)**
Local broadcast radio stations	71 (82.6)
National Weather Service	69 (80.2)
NOAA weather radio / Emergency Alert System (EAS)	68 (79.1)
Local broadcast television stations	56 (65.1)
HAM radio operators	36 (41.9)
Text messages	35 (40.7)
Crawler on the bottom of the television screen	28 (32.6)
Email	26 (30.2)
Internet	26 (30.2)
Mass telephone calls	20 (23.3)
Television / government access	18 (20.9)
Other	10 (11.6)
Civil authority	7 (8.1)
Highway message boards	2 (2.3)
No announcement	0 (0.0)
Other	10 (11.6)

Note: 6 (6.5%) missing

The respondents to the EMA survey confirmed that 75.6% (65) of the respondents expressed satisfaction with the severe weather information provided them by the National Weather Service (Table 5.95).

Table 5.95 Forecast information provided by the National Weather Service (NWS) to the county emergency management agencies

Communication (EMA)(Q23)	***n*= 86** ***n* (%)**
Somewhat Satisfied	21 (24.4)
Very Satisfied	65 (75.6)

Note: 6 (6.5%) missing

County emergency managers depended on receipt of severe weather information in a timely manner and provided severe weather information to the public in order that appropriate protective actions were taken. Table 5.96 shows that 74.4% (64) of the county emergency management agencies were very satisfied with the timeliness of the information provided by the National Weather Service.

Table 5.96 Timeliness of severe weather provided by the National Weather Service (NWS) to county emergency management agencies

Communication (EMA)(Q23)	***n*= 86 *n* (%)**
Somewhat Satisfied	22 (25.6)
Very Satisfied	64 (74.4)

Note: 6 (6.5%) missing

The study shows that 65.1% (56) of the respondents were very satisfied with the accuracy of the information provided by the National Weather Service (Table 5.97).

Table 5.97 Accuracy of severe weather information provided by the National Weather Service (NWS) to county emergency management agencies

Communication (EMA)(Q23)	***n*= 86 *n* (%)**
Not Satisfied	4 (4.7)
Somewhat Satisfied	26 (30.2)
Very Satisfied	56 (65.1)

Note: 6 (6.5%) missing

The improvement in radar technology has enabled the National Weather Service to provide more accurate and timely forecasts to the emergency management community. The survey respondents indicated that 62.4% (53) of the county emergency managers were of the opinion that weather forecasting over the last five years had become increasingly accurate (Table 5.98).

Table 5.98 County emergency management agencies' opinion concerning the accuracy of weather forecasts provided by the National Weather Service (NWS) during the last five years

Knowledge/Experience (EMA)(Q24)	***n*= 85** ***n* (%)**
A lot more accurate	53 (62.4)
A little more accurate	26 (30.6)
Has Stayed the same	5 (5.9)
A little less accurate	1 (1.2)

Note: 7 (7.6%) missing

5.3 Conclusion

This chapter reviewed the quantitative results of the general public, broadcast media and emergency management surveys. It also provided a descriptive interpretation of the survey results.

General Public

The study shows that respondents who had experienced a disaster were better prepared than those who had not experienced a disaster. Only approximately one-third of the respondents owned a NOAA Weather Radio. A group trend was noted whereby the general public received additional severe weather information via television and electronic media (i.e. - email, internet, etc.).

Broadcast Media

The study found that most of the broadcast radio stations were staffed during daytime hours only, whilst most of the television stations were staffed 24 hours a day, and seven days a week. Only two-thirds of the radio stations surveyed had back-up generators to 100% of the television stations surveyed having back-up generators. More than half of the radio and television stations had not participated in a severe weather exercise. Both radio stations and television stations had limited capabilities to broadcast in any language other than English. Most of the radio stations and television stations were satisfied with the information they received from the National Weather Service.

Emergency Management

Approximately one-half of the emergency managers surveyed had one to two staff members within their agency. In the state of Tennessee, 8.1% of the counties did not have an emergency operations centre with back-up power. Emergency management stated that the NOAA Weather Radio was one of the reliable warning systems used today. Emergency management surveyed had an excellent working relationship with the National Weather Service. With regard to addressing the non-English speaking community, emergency managers had initiated projects to provide brochures in Spanish. However, it was found that deficiencies in disaster training and community preparedness activities still exist.

Chapter 6 – Results Section – Qualitative Analysis

This section provides evidence of the thematic analysis of the focus groups undertaken with the public, broadcast media, meteorology and emergency management focus groups. These groups were formed based on the population of the Nashville Metropolitan Statistical Area (MSA). The scripted questions utilised in each of the focus groups were related to participants' knowledge and experience levels, levels of preparedness, perception of risk and communication strategies associated with alerts/warnings for severe weather events.

6.1 Qualitative Focus Groups

The views of the participants from the six focus groups are presented in this section. Within these focus groups, facilitated discussions were conducted with identified population segments to discuss severe weather related issues.

6.1.1 Focus Groups - Samples

To elicit information regarding levels and development thereof of severe weather preparedness in the community, six focus groups were conducted using a semi-structured schedule of questions (See Appendix H). Participants in the focus groups were selected using a convenience sampling method. A description of each group follows.

6.1.1.1 Public Focus Group 1 (P1)

The general public focus group 1 (P1) was conducted at the Parthenon Towers Apartment Complex. This government housing complex is residence to 295 individuals and was developed for the underserved (low-income and senior living) population of the Nashville, Tennessee area and, as such, was relatively representative of this segment of population in the Nashville Metropolitan Statistical Area (MSA). The general public focus group 1 (P1) consisted of fifteen participants ranging from 42 to 73 years of age, both male and female in gender.

6.1.1.2 Public Focus Group 2 (P2)

General public focus group 2 (P2) was conducted at the First Unitarian Universalist Church in Nashville. This focus group, also representative of a particular segment of the Nashville Metropolitan Statistical Area, included five participants ranging in age from 25 to 64, both male and female in gender.

6.1.1.3 Public Focus Group 3 (P3)

The Nashville Area Hispanic Chamber of Commerce assisted in the selection and coordination of general public focus group 3 (P3), as well as the subsequent translation of information provided by this focus group. Focus group 3 consisted of nine Hispanic/non-English speaking participants ranging in age from 21 to 65, both male and female in gender. The focus group volunteers were eager to participate, given the rare opportunity to voice their past and present experiences with regard to severe weather alerts/warnings and related issues. The focus group participants ranged from individuals having limited education to college graduates and legal citizens as well as illegal immigrants.

6.1.1.4 Broadcast Media Focus Group 4 (B)

The Tennessee Association of Broadcasters (TAB) assisted with the coordination of the broadcast media focus group 4 (B). TAB sent emails to its membership and requested volunteers to participate in the broadcast media focus group. This focus group consisted of ten participants representing both male and female respondents from broadcast radio and broadcast television throughout the state of Tennessee.

6.1.1.5 Meteorology Focus Group 5 (M)

The National Weather Service (NWS) assisted in recruiting television and National Weather Service meteorologists by contacting each of the television stations via email asking for their participation in this focus group (M). Five television meteorologists and three National Weather Service meteorologists participated in this focus group.

6.1.1.6 Emergency Management Focus Group 6 (E)

The Tennessee Emergency Management Agency (TEMA) assisted in coordinating the emergency management focus group (E). Ten county emergency management directors within the Nashville Metropolitan Statistical Area and five representatives from TEMA participated in this focus group.

6.2 Knowledge and Experience

Presented in this section are descriptions of the knowledge and experience levels of the focus group participants of previous weather emergency.

Theme: Prior experience with weather emergencies

Many of the public focus group participants had had prior experience with a severe weather emergency. The majority of participants in public focus group 1 had experienced tornados and ice storms, whereas participants in public focus group 2 had experienced tornados, ice storms, severe thunderstorms and flooding. Public focus group 3 participants had experienced flooding and hurricanes.

> *'Ice storm and tornado.' – (MG - P1)*
>
> *'Yes, I've been in tornadoes. I was in the flash floods that came through last week [July 10-16, 2011]. Been in snowstorms, blizzards up in Illinois, and just about everything in between.' – CB (P2)*
>
> *'Yes, last year, the flood in Nashville.' (CM – P3)*
>
> *'Yes, back in Miami with [Hurricane] Andrew.' (MQ – P3)*

Theme: Knowledge of and use of various warning systems

Inclusive in a comprehensive community warning system is one or more of the following: community sirens; text messaging; cellular phone applications; email alerts; NOAA Weather Radio; crawlers (subtitles) on the bottom of the television screen; and mass phone calls and emergency alert system (EAS). The public focus group participants had knowledge of the existing severe weather warning systems in their area. Each of the three public focus groups expressed individual preference as to the way in which they would like to receive severe weather information. Most of the participants in the public focus groups relied on community sirens, telephone, television, NOAA Weather Radio and/or the internet for severe weather updates. Some participants were aware of the existence of the siren system in the Nashville area.

> *'Sirens, telephone (it will come through on my phone to let me know if the weather gets bad; it will come through the phone and tell you), the news.' – (LB - P1)*
>
> *'All my life there has always been sirens that you can listen for. If I know something's going on I do watch the little tickers on the bottom of the TV. Other than that, I'm still waiting for them to come out with an app for my phone to get the instant ID, but I don't get any kind of phone calls or emails.' – (CB - P2)*
>
> *'If you're asking what's available, I know that all of the television stations (or at least Channel 2) have a service that you can sign up for that will text or phone and / or email you when there is severe weather. Of course, there is the crawl at the bottom of the screen and a little radar image at the bottom of the screen. Just in the last decade or so, they have made them include that on cable stations because they didn't have to at one time. Of course there is NOAA weather radio which is silent until there is an emergency that you can adjust the threshold for the alarm into your area. And there are tornado sirens, which they didn't have here in Nashville until after the '98 storm. And then of course radio and TV and the whole bit. But as far as alert systems, it's NOAA weather, things that you can sign up for, commercial services, and interrupting television shows.' – (JD - P2)*

'I do it through the internet or TV.' – (MQ – P3)

'I watch the Weather Channel.' – (CZ – P3)

A majority of the public focus group participants had NOAA Weather Radios, with nearly everyone holding the perception that NOAA Weather Radio was the most effective warning system. Some participants in public focus group 2 stored a NOAA Weather Radio in a closet or identified place due to its lack of convenience. Members of public focus group 2 also relied on cell phone applications and upon the internet. One particular participant in public focus group 2 stated that cellular phone systems had limitations which could potentially render them ineffective during disasters.

'I would think that the system that runs with the smart phone would be the best solution looking into the future and they will probably all going to have them within a year or so. Anyway the price will come down and it will be ubiquitous. And the fact, as [CB] has said, that they have their own power source, they're mobile, you always have them with you; if you're in the car or wherever you are, you get it there. The only problem I can see is cell phone systems collapse like in 9-11; they didn't work because everybody used them at once and they don't work anymore.' – (PG - P2)

'I definitely have to say my phone too, mainly for the reason that it's always with me. As long as the battery is charged, I know I've got some source where if the power goes out, you don't have radio or TV or any of that. Plus what I really like on that AccuWeather is that they have a severe weather statement, so that the moment the NWS [National Weather Service] releases something it posts onto AccuWeather and I can look and it doesn't matter what kind of weather it is. I know it's always going to be there.' – (CB - P2)

'I think the best way is the weather radio.' – (GS - P1)

'Yes, I've had mine for a long time, I tell them to hit clock, Oh it's coming this way.' (GG – P1)

'No, and I wouldn't have one because they are just an annoyance. I was at a friend's house last week - it went off, it squeaked for 6 or 7 minutes, unintelligible nonsense, and I wanted to rip it out of the wall.' (PG – P2)

'It's just not all that convenient and I probably wouldn't know where to find it. It would be stuffed away at the bottom of the closet or something.' (BT – P2)

Unfortunately, approximately half of the non-English speaking participants in public focus group 3 had no knowledge of the NOAA Weather Radio or its capabilities.

' …but I don't really know what is a weather radio because this is what I am understanding, assuming what a weather radio could be. It could be a radio that has the capacity to capture the signal of different radio stations from around the country or the world. That's what I understand. And then it has the capacity to receive a signal, a radio signal from anywhere else.' (LS – P3)

The broadcast media focus group participants stated that the compilation of systems to alert the population throughout Tennessee consisted of broadcast media, siren systems, text messaging and NOAA Weather Radio. It was expressed that, due to limitations of community sirens on poles and in order to be effective 24 hours a day, seven days a week, a comprehensive alert/warning system should be a multi-point system. Members of the broadcast media focus group explained that a multi-point system consist of community sirens, broadcast television, broadcast radio, NOAA Weather Radio, the internet, social media, text messaging, including developing systems.

'In Nashville, after the 1995 tornadoes that blew through the northeastern part of Davidson County. Nashville got interested in revitalizing their storm sirens, and that's now 16 years ago. They have done a pretty good job of them, but there's a reason we're in the broadcasting business sending signals through airwaves and not with speakers on the poles. Speakers on poles suck. Think back to World War II and the Japanese had these megawatt amplifiers in Tokyo to do air raid sirens and you still couldn't hear the things. There's a reason we're not just broadcasting our radio stations from speakers on poles. Nashville has storm sirens. They usually put 25- or 30-foot poles around the city: on school property, city parks, and highway right-of-ways. But to say they're audible across the

> *whole county is sort of a farce. I continue to believe that broadcasting is the best way to reach people. We get into their homes, get into their buildings and everything.' (GP – B)*

The meteorology focus group participants stated that they utilized information from the National Weather Service, emergency management and the private sector when providing alerts/warnings to the public. The meteorologists used all available methods within a comprehensive alert/warning system in order to convey effective messages to the public.

> *'Besides us on TV and radio, there are sirens in some communities. NOAA weather radio is one of the most important tools, especially at night when people are asleep.' (DN – M)*

> *'All of the methods are effective.' (DN – M)*

Participants of this group were of the opinion that few obstacles are faced in alerting/warning systems for severe weather events.

> *'There are not many obstacles. Occasionally computer equipment fails, but we have back-up systems.' (DN – M)*

Broadcast media focus group participants felt it essential that they should have established triggers for alerting/warning the general public of severe weather watches and severe weather warnings. Participants in this focus group used severe weather information from the National Weather Service. Some radio stations in the broadcast media sector obtained information from the Associated Press (AP) along with severe weather software in their decision-making process.

> *'I'm in Knoxville with WIVK. We're the Local Primary - 1 (LP-1) Emergency Alert System (EAS) entry station in Knoxville. Our policy is much similar to that of [BW]'s at WATE. We will carry warnings. Our on-air staff will mention watches; if there's one, they'll mention it in a break in music or a*

> *break in programming. Tornado warnings issued by the National Weather Service are an immediate takeover of our air chain. Severe thunderstorm warnings are on a timed relay, meaning they give our staff a chance to catch those and put them on the air, and if not, after a very short interval of time, then they will be relayed as well. We do not relay watches automatically or at any point, for that matter. They're on…our EAS equipment is programmed for a timed ignore – meaning that we get the message, we see it, that's not our primary delivery route there. Our primary delivery route there on watches would be either the pop-up software that I mentioned that actually pops up on the on-air computer that the air person sees or via the AP (Associated Press) wire.' (TB – B)*

Participants in the meteorology focus groups stated that, whilst tornado warnings warranted continuous coverage, information from the National Weather Service, as well as Weather Service International (WSI) and AccuWeather, assisted in their decision making process with regard to all severe weather alerts. Some meteorologists noted an increase in the use of social media to alert the public of impending severe weather that potentially could have an impact on the viewing/listening audience.

> *'Our Weather Central computer called "SimulCAST" automatically puts alerts on the bottom of the screen. As mentioned before, tornado warnings warrant continuous coverage. Severe thunderstorm warnings usually warrant the crawl and cut-ins, though occasionally continuous coverage.' (DN – M)*

> *'One of the great things we have with our weather systems, whether it's WSI [Weather Service International] or AccuWeather, it's automatic. Everything is automated, so the moment there is a warning, severe thunderstorm, tornado watch also, and for flash flood watch, those are all automated. So we don't actually even have to be there; it just goes straight through the system. So that's one of the cool things. When we are in the shows, whenever there is severe weather going on, I think it's standard at any place, just likely lead and start. But whenever there's watches and warnings for the shows, we usually get to start off and say what's happening. And like [LSF] said, if it's a whole weather outbreak in the middle of the show, we typically just get to cover it. During the afternoon, if it's just your afternoon severe thunderstorm warning here or there, it depends really on location, how much population is being impacted and covering up commercial breaks. So commercial breaks, especially National Weather Service breaks, where we typically just try to cover up, and if it's more than a large-scale (not huge severe weather)*

> *large-scale, big storms all over, try to as best as we can cover up some breaks here and there, just display that. Also, as [DT] mentioned, social media - Facebook, Twitter - I don't know how people get their notifications, but I do a lot of that and it seems that a lot of people are perceptive to it. Since we are in the world of social media, it's just another avenue to take.' (BS – M)*

Participants in the broadcast media focus group had established protocols to interrupt pre-recorded broadcasts to relay severe weather/imminent threat information to the public. It was indicated by one member of the broadcast media focus group that time of day and time of year impacted on the manner in which severe weather alerts/warnings were broadcast to the general public.

> *'Any broadcast, I mean if something happens in our case, like I said, sporting events, a weekend morning or a holiday, and you're hours away from having a meteorologist in the building, master control will put the crawls on the air. But if they feel it's imminent enough, they will check with the meteorologists as well, as most of them stay in tune to weather when they're away and watches and warnings start popping, they come to work early. And meteorologists or any department head in our building has the authority to tell master control to put a meteorologist on the air with a cut-in and pre-empt programming if needed. So a meteorologist and a production crew at night, let's say at 9:00 pm at night and there's no management in the building, a meteorologist can make the call that he needs to cut in and cover programming with a tornado or thunderstorm warning bulletin.' (RM – B)*

> *'I guess I'll answer for the radio side. If we're in something that's pre-recorded or we're running automated programming, our emergency alert equipment is programmed to interrupt the air chain based on how it's programmed, which in this case, as I mentioned earlier, would be for tornado warnings, severe thunderstorm warnings, and flash flood warnings.' (TB – B)*

The meteorology focus group participants stated that the size, complexity and area affected by the severe weather potential influenced the content presentation of the alert information on television. The meteorologists also noted that what was on the air at the time of the alert impacted the manner of communication of severe weather information, as well as the ability to provide closed captioning.

> *'Most tornado warnings warrant "wall-to-wall" continuous coverage until they expire. For severe thunderstorm warnings, flash flood warnings, we normally use the crawl, followed by "cut-ins" during commercial breaks. Occasionally, they also warrant continuous coverage. Our management makes decisions on how long we stay on during continuous coverage.' (DN – M)*

> *'On a day-to-day basis, normally at our station (the other guys can speak for themselves) but I think most of the time it's that weatherperson on duty at all the stations that's making the, I guess the request, making the graphics that will appear in that weathercast. So it is up to that weatherperson on duty for the day-to-day weather. Now when it comes to a general outline of the line or the flow of the weather or certain things that we do during the weathercast or how things are presented, then you end up with a host of people, whether it is either the management team of the station or the news director that may make an input in that. Some stations have consultants and the consultants will sometimes maybe guide us.' (LSM – M)*

> *'We do closed captioning for the deaf during severe weather coverage. Since this is not scripted like the news, a service transposes our live audio to closed captioning.' (DN – M)*

The county emergency managers within the emergency management focus group stated that the comprehensive alert/warning system primarily in use by this group consisted of NOAA Weather Radio, outdoor sirens and a Dialogic Alerting System. Most of the county emergency managers relied on the NOAA Weather Radio to receive severe weather alerts and warnings.

> *'Our primary push is National Weather Service plus NOAA weather radio. Again, it's a robust system that's in place. When we look at that and talk to people who have those and who don't…you know 90 some-odd percent of people are going to have smoke detectors. You ask them if they have an all-weather radio; they don't. So I guess the fear of dying from smoke is one thing but from a storm is not – not until something like Joplin, Missouri, occurs or what has happened all across the Southeast. But that's our primary form. We really push that. I talk to all of our mayors and a good portion of our councilmen and county commissioners. We talk about outdoor warning sirens. We think that's a good next step, and like [TH] said earlier, it's not the answer, so that's our primary warning way.' (KW – E)*

> *'We rely on the weather radio. That's what we push. We have a very rough topography where we are flat in part of the county and hilly in the other. We have one city that has an outdoor siren and we have four fire departments that have old sirens. That's how they alerted volunteers years ago. If somebody is there to sound the alarm, they use it for a tornado warning; if not, it doesn't go off.' (EH- E)*

> *'One more thing, if I could. We do have a reverse type of 911 system, dialogic system, the state has been using for years. We do not use them for weather events because it's a time / labor very intensive issue. Typically by the time I would identify an area of the county that may be impacted and send the warning out, the storm's already past, so it's not effective for storm warnings. We use it more for public safety type warnings where we have flooding events or perhaps a hazardous materials event. That is a very effective system for that.' (TH – E)*

County emergency managers indicated the importance of the role played by the broadcast media in notifying the public of severe weather having potential to impact the area. They noted also the timeliness of updates provided to the public by the broadcast media. The county emergency managers also expressed the opinion that NOAA Weather Radios were an essential part of an effective alerting/warning system, as tornados with most impact occurred at night in Tennessee. On a regular basis during severe weather season, county emergency management agencies conducted a conference call with the National Weather Service about the expected weather for the week.

> *'Broadcast media. They do an overwhelming job of covering storms that come through. That's not for immediate notification, but once people know that there's a specific threat involved, they turn on the TV. The amount of information there is really impressive, I think. As far as the front end, the biggest change I can see in the latest months is the National Weather Service (at least here in the Nashville area) has started giving us weekly briefings when we have potential weather impacts that are coming into the area that allow us to preplan and pre-notify a vast amount of people – to let them know that "this week there is potential for this or that to occur and we will be notifying you as the risks increase / decrease while time goes by." Those have been huge. When we do those briefs, I send them out to everybody across the county so they can know, "well OK, Wednesday-*

Thursday may be bad" so they will be paying more attention. So I think anything we can do to preplan is a good thing.' (TH –E)

'I think the NOAA weather radios are #1. You're two-and-a-half times more likely to die in a tornado at night because you're not awakened by something unless you sleep with a TV on or the meteorologist on [channels] 2, 4, 5, or 17 can get your attention while you sleep. There has to be a mechanism to get you awake. So I think the NOAA weather radios. To some degree I think weather as of late is sensationalized, and again I say that to some degree. I don't know what degree that is. I think meteorologists do a great job, but, gosh, I think sometimes it's too much.' (KW – E)

Participants in the emergency management focus group used information provided by the National Weather Service to establish severe weather triggers to alert/warn the general public. The emergency managers agreed that community education related to severe weather played a critical role on the public's understanding of severe weather alerts/warnings and the associated risks. The existence of challenges existing in dealing with 'municipalities within municipalities' was mentioned by the emergency managers, as well.

'It's still driven by the National Weather Service.' (TH – E)

'Same thing. I mean, we put our warnings out there. Our emergency people…once we get it from the National Weather Service, we are not going to do what the weather men do. Emergency management, in my opinion, will not be meteorologists. The worst thing I want to do is report something on the north side of the county and something hits the south end. We rely totally on the National Weather Service.' (EH – E)

'Just a little side note on that. A challenge we've got is that you have multiple municipalities within municipalities that may have different trigger points, but their warning system doesn't know the boundaries. It's not political; the sound doesn't stop at the city limits, so it creates problems if they are not coordinated.' (AL – E)

Contingency plans were in place by participants of the emergency management focus group to alert/warn the general public about severe weather and/or hazardous events that could occur in their area as the result of power failure.

Members of the emergency management focus group stated that NOAA Weather Radio, with working batteries in place in the radios, and an enhanced severe weather public education programme were beneficial and informational to the community. At the county emergency management level, county managers stated the community siren system had battery back-up as an emergency power supply in the event of a power supply outage.

> *'If they have a weather radio, it has to be on battery back-up.' (EH – E)*
>
> *'Again – education. The public doesn't realize for all hazards it's a dissemination for all information because we can touch the public with any types of information and tell them where to go to get the rest of the critical information.' (TH – E)*
>
> *'Additionally we have on our siren system's battery back-ups on those sirens so we still have the ability and capability to sound those sirens even if the power's out.' (MP – E)*

Theme: Opinions of current systems

A majority of the public focus group participants expressed the opinion that information received regarding severe weather alerts/warnings was quality information. One particular participant in this focus group stated that broadcast television stations conveyed precisely the locations of tornados, whilst another participant stated they had no recall of having received severe weather information from the broadcast radio stations. Another focus group participant indicated that broadcast television stations occasionally overreacted to severe weather events.

> *'On channel 5, they will state exactly where a tornado is fixing to hit, give you the warning, give you so much time, minutes, you know to prepare yourself for that, Stay on 5 and 4, they go down the line where it's going to hit and when it's going to hit.' (LB – P1)*

> *'I really don't have too much opinion about radio because I don't recall being in a weather emergency where I got that kind of information on radio. The NOAA weather radio is only good for the warning. When the alarm goes off, I usually go to the TV and again I don't rate any of the local stations higher than any of the others, I don't think. And like I said, I tend to hang online.' (JD – P2)*

> *'I think they are pretty accurate. I think sometimes when they are sending warnings they could overreact, I guess. But I think it's better to be that way than not send any alarms or warnings at all.' (LS – P3)*

Whilst most members of the public focus groups 1 and 2 indicated that the information was received in a timely manner from broadcast television, one participant from public focus group 2 stated that broadcast radio was not timely in delivering severe weather information to the public.

> *'I think it's very accurate on the timing.' (PW – P1)*

> *'I don't view the radio information as timely at all. I don't have a specific channel to go to. You can listen forever before you have an actual update. Obviously the TV is very up-to-date and almost to the point where they're in competition to see who can spot the tornado. And of course right now, it seems like we're all talking about tornadoes, and other weather emergencies we aren't really discussing. But, yes, it's almost a competition, if you can see the damage, if you can see the rotation, see the severe weather events first. So I see TV as being really up-to-date.' (JD – P2)*

> *'I agree. Often they will tell you if the storms will be over such-and-such a place at 9:42 and then at 10:15 it's going to be over there. So you have a pretty accurate…I think your comment though, for instance when the flood came, all of it was useless because it depended on if my creek came up high enough to flood my driveway, where I couldn't get out of my neighbourhood or I couldn't get to the grocery store. And that, nobody can help you with, until you pull out into the road and see what's flooded.' (PG – P2)*

Most of the participants of the public focus groups felt that severe weather information received was accurate and most trusted the news conveyed by the broadcast media. As stated previously, however, some indicated an overreaction to the severe weather threats by this segment of the media.

> *'Yes, I feel they are accurate, because when they say it's going to be in the 90s, they usually get us to 90. When it's getting bad weather and cloudy and it's raining in Kentucky and Clarksville and is heading this way and more than likely we will get it before that day is over.' – PW (P1)*

> *'I think it's pretty accurate. I don't think the temperature forecast is completely exact, but within a couple of degrees. But for general weather, yes, I trust what I hear.' – CM (P3)*

> *'I agree with CM. I think they are pretty accurate. I think sometimes when they are sending warnings they could overreact, I guess. But I think it's better to be that way than not send any alarms or warnings at all.' – LS (P3)*

Members in public focus groups 1 and 2 thought the information presented on television was easily understood and interpreted. However, this was not the case for one member of public focus group 1 who was of the opinion that severe weather information from broadcast television was *not* always easily understood and interpreted. Some of the participants in public focus group 2 thought radio stations provided oversimplified and vague information about severe weather. Members of public focus group 3 expressed numerous concerns about information provided to the non-English speaking community from both broadcast radio and broadcast television. A member of this group expressed the need to educate the public regarding the graphic tools used by broadcast meteorologists and to explain the meanings of the different colours used by broadcast meteorologists when explaining a severe weather event. A concern was also communicated regarding the amount of information presented on the screen during a severe weather event. In addition, the need to educate the public in distinguishing the difference between a severe weather watch and a warning was mentioned.

> *'I feel that all these stations, and I watch them all, whenever there is bad weather coming, they are all very accurate. And if it's getting close, they will let you know, "if you are in such-and-such an area, you need to get to your safe place now." I feel they are all very accurate on reporting the bad weather.' (PW – P1)*

> *'I'd also agree: the radio is pretty vague. "Here's the town, here's the area" - then back to the radio and whatever song is on. As far as for TV, I think they almost have too much information.' (CB – P2)*

> *'I think when you speak English a little bit it's kind of easy to understand, you know, what they are trying to tell you. When people don't understand English, it's kind of hard because they don't know what they are talking about and just depends which channel you're looking or different stations or the radio, I mean just all depends. But if you understand English, if you pay attention, then you can understand what they are talking about.' (MS – P3)*

> *'I think that sometimes it's kind of hard to understand the way, what's a warning, what's a watch, all that kind of stuff. And the TV stations and the media doesn't educate, like for example, when we have the terrorism levels, you have yellow, green, whatever and it goes through progressing. It's easy to understand. There's a visual that people can go through. But there's so much information that is plastered over the maps and the news guy gets up and everybody wants to play with 3D this, 3D that, and all that kind of stuff that it loses the message. And sometimes it's very hard to determine where we are, what kind of steps we need to take, and if we are in true danger of it.' (MQ – P3)*

> *'I ask him [AB] how is it easier for him to understand. "When the red goes on, that's danger.' (MQ – P3)*

Members of the emergency management focus group indicated the view that community disaster education played a role in the public's understanding of the severe weather threat and protective actions to be taken. With regard to the conveyance of such information, county emergency managers viewed NOAA Weather Radio as an important tool in alerting/warning the general public and the hearing-impaired community. These managers also favoured the use of reverse

911 (mass notification) systems. Several concerns of this group were noted. In particular, one participant of the emergency management focus group stated there was a difference in the message being conveyed to the general public and the manner in which the general public reacted to the message. This same focus group participant expressed the importance of the role of public education in the public's response to an alert. Another concern was communicated by a member of the county emergency management focus group regarding the challenge of notifying the hearing-impaired and/or the blind in their community.

> *'Complacency, I think. I know alerting is one thing and getting that message out is one thing. But then the public…and I pretty much say that I can ask anybody in this room: a tornado warning goes out, how many of you look out the window? Most of us do. Or they look to see what's going on instead of doing what they are supposed to do. Now we are in a little bit of a different situation in regards to responsibility and what we are doing. But getting that message out and people doing what they are supposed to do are two totally different things. It goes back to education.' (KW – E)*

> *'I think the lady from Maury County [PW] indicated that the public has to be educated to the fact that they have to have responsibility for themselves. If you get up in the morning and it's terribly cloudy or it looks foreboding outside, it's your responsibility to check that cell phone, to listen to media, to listen to the weather radio, make a phone call. We have a responsibility to activate the tools. As the old saying goes, "you can lead a horse to water, but you can't make him drink." If they won't listen, if they won't participate in life, they won't get the warnings they need.' (JJ – E)*

> *'One other challenge with notification are pockets such as hearing impaired or the blind or not all weather radios have some type of device to interconnect to notify those persons. You also have language barriers.' (AL – E)*

As stated previously, most of the members of the emergency management focus group felt the information received from the National Weather Service was accurate and very reliable. This view was also held by some of the rural counties near the state line.

> *'The information is put out in regards to watches and warnings based on data that they receive, so it's got to be accurate.' (KW – E, TH – E, EH – E, PW – E, JJ – E, and SS – E)*

> *'I disagree. In the middle of radars in Nashville, Memphis, Clarksville, Birmingham, and Mississippi. We are right in the no-fly zone. Our information is totally inaccurate. We have to have information from on the ground to get accurate information.' (RF – E)*

> *'I would agree that the information lately that we've been receiving from the National Weather Service (part of the conference call we've been part of have) been for the most part accurate this season. I also agree with [RF] that there are some issues.' (CH – E)*

Participants of the emergency management focus group, however, were of the opinion that there exists room for improvement in the timeliness of information conveyed.

> *'I've got to talk about a specific incident. Technology is not where it needs to be. One case in point, September '09. The weather on TV, the meteorologist, the Weather Service – nobody indicated anything bad would occur that night, when we had the potential for severe weather. Go to bed. At 10:30-11:00, get a call from the sheriff's office. All of a sudden we got a tornado on the ground. So I head towards the scene where the tornado is supposed to be on the ground. Lot of radio traffic. I called the Weather Service and they were unaware of any tornado or any signature of a tornado. They had to go back to data and find that. I think that's true with TV meteorologists also: the technology's not where it needs to be too readily identify…first and foremost, they can't say a tornado is a tornado. They can only see certain things. But technology is a huge issue.' (KW – E)*

These group participants indicated that, whilst information they received from the National Weather Severe was easily understood and interpreted, room existed for improvements in zonings, sirens and other software. The emergency managers preferred the use of polygon warnings and geographically targeted warnings. Some of the members of the emergency management focus group stated that complacency was a significant issue with the general public due to the large percentage of issuance of false warnings.

> *'I think one of the things we've noticed, technology-wise – early warning, outdoor warning signs – is the ability to apply the technology, so TV and the National Weather Service can really storm-track and hone in on where a specific cell or something is going. But our warning technology hasn't always linked up with that. So looking at zonings, sirens, and some other software applications is one of the things we've been working on to try and not confuse the public…if we have on the southern end of the county, a storm system moving, people on the north end of the county with sirens going off and they are under a warning. So I think from our perspective the ability to look at it and use it from a somewhat trained eye has been pretty good. The ability for the public to interpret that data, I'm finding questions about. "Should I take shelter if you know I'm on the north end of the county and the south end of the county?" The warning goes out for the county as a whole and it's hard to, you know, explain that quickly and easily to the public at large. So I think the technology is getting there, but my ability to apply that, well, is an area we need to still grow into.' (MP – E)*

> *'We are probably getting ahead of ourselves because we're talking about the human behaviour part of it. Complacency is a huge issue. 75% of warnings nationwide are false. 82% of them in Sumner County are false. Clay County is 100% right now, so that's a big issue. And the Weather Service has the Polygon, the capability to do Polygon. They don't issue watches and warnings based on Polygon. They issue them countywide. So the correlation between the area in danger and the area that's giving the warning is skewed. I wish they would do something about that, to be able to say "this particular area is under a warning," rather than the whole county.' (KW – E)*

Theme: Ideas for improvement

Meteorology focus group participants communicated the desire to have more remote cameras throughout the community as a means of improving the alerting/warning system. With reference to this aspect of alerts/warnings, one participant in the meteorology focus group stated that the existing radar system did not indicate whether or not a touch-down of a tornado had occurred.

> *'I would like to have more remote cameras. The times that we have been able to show a tornado live on camera, the warning was taken more seriously than when we were just showing the signature on radar. On radar, we don't know if the circulation is reaching the ground or not. When the viewers (and us) see it on camera, it's confirmed. We have two cameras now in Nashville. The budget is preventing more for now, but that will change in the future.' (DN – M)*

Emergency management focus group personnel desired technology better enabling them to determine this specific information and to provide more site-specific information in general. Others within the emergency management focus group stated that issues with limited cellular phone coverage in certain areas and limited access to community sirens in rural counties were inhibiting factors in the dissemination of warning information. They expressed the desire for improvement in this aspect.

> *'One that tells us a tornado is on the ground. I know that's stupid, but something that tells us a tornado is a tornado. We don't have that.' (KW – E)*
>
> *'More site-specific information.' (TH – E)*
>
> *'I concur with both of these, but, very briefly, there's part of a communication then there's some that, #1, some areas aren't able to receive – people can't receive their cell phone or can't get a cell phone in their home, (I mean they have cell phones but you can't get reception to it in those locations), so we've got to find another means for them to be able to hear. Just like me: I use dish network; well, when the storms come through, there goes my TV stations, even the local ones. So site-specific on getting that there, but also sirens won't work out in those rural areas. I mean we can't even use our own sheriff's department. May have to drive up the hill to get a signal to get out on their radios. It's that much of a difference. We still leave out a large area of people and our thing is: how are we going to do it? Everybody says put the sirens out; it won't go nowhere.' (PW – E)*

Themes: Regulatory requirements

No knowledge of any requirement, other than closed-captioning for the hearing-impaired, was indicated by any member of the broadcast media focus group participants.

> *'Don't know of requirements, except that when going to continuous coverage, we are required to add closed captioning for the deaf.' (DN – M)*

6.3 Level of Preparedness

The section addresses the level of preparedness of focus group participants.

Theme: Contingency planning

A majority of the public focus group participants identified disaster supplies that could be used during an event that impacted the community.

> *'Battery-operated flashlight, battery-operated radio, extra batteries, a magazine I can fold up and put in a door so I don't get locked in the stairwell. That is all I can remember right now.' (MG – P1)*
>
> *'I have a complete emergency and first aid medical kit. Everything you need if anyone gets hurt.' (PG – P1)*
>
> *'Battery-operated CB radio, canteen, bottles of water and a map and first-aid kit.' (CM – P1)*
>
> *'Well, I have a first aid kit and a blanket in my car. And at home I don't have a kit but I have water, candles, a flashlight, and batteries.' (PS – P2)*

Some of the public focus group participants stated that prior disaster experience had led them to improve their level of preparedness. A participant from public focus group 1 noted, however, that some people did not heed warnings given to them.

> *'When I was in a flood warning they evacuated a lot of people and I noticed there are people sometimes that don't take heeding to warnings on floods and they get caught in them. Sometimes they lose their lives and the question is "Is there any way to reassure people like that, that their safety is more important than their belongings?" – GS (P1)*

Another participant from public focus group 2 stated, on the other hand, that caution now prevailed following a prior experience, particularly while driving on water covered roads.

> *'Yes it did, especially how I deal with water over the roads, over surfaces when I'm driving. I'm not going to be driving my car into water where you can't see the road anymore and I pay more attention to warnings about tornadoes if they've been sighted in the area.' – BT (P2)*

Among the public focus group participants whose prior experience had led them to improve their level of preparedness, many had purchased emergency supplies in an effort to be better prepared.

> *'I'm almost obsessive after the tornado here in Nashville. I bought a portable battery-operated TV which they made obsolete last year by changing to the digital standard. I've got a weather alert radio and I bought those for my family as well. And I always turn on the TV when I'm home and the weather looks threatening and check the internet.' – JD (P2)*

As indicated, whilst most of the public focus group participants held an appreciation of the harm a disaster could cause and thus better prepared themselves, for some there was no change in behaviour or preparedness. Again, the previously mentioned sense of complacency appeared to be factor.

> *'I'm sort of blasé about the whole thing.' – PS (P2)*

‘I haven’t changed anything.’ – PG (P2)

Various issues with regard to better levels of preparedness were addressed by group participants. Broadcast media focus group participants reported having contingency plans in place and addressing infrastructure issues that could occur during severe weather events. Broadcast radio reportedly experienced an easier time with infrastructure issues, providing they were able to access the transmitter and tower. Broadcast media focus group participants also indicated that digital television and cable carriers limited the television station’s ability to relocate at a transmission tower and relay information to the public; evidencing a need to rectify this situation to achieve a better level of preparedness. Some members of the broadcast media focus group indicated the need for some type of identification for broadcast radio and broadcast television personnel to facilitate prompt access in the event of an emergency.

> *’From the radio side of things, it’s a little easier for us. The biggest problem that most radio broadcasters are going to have, particularly FM broadcasters, is their transmitters are going to be located some distance away from their studio. So it’s going to be a matter of access. Our transmitter’s on top of a 3,000 foot mountain. The road is paved; it’s a decent road. But if there’s inclement weather and weather has affected the roads, then it’s going to be a hike. On the other hand, we do have a fully separate, completely redundant back-up transmitter site that’s within two minutes of our studio that has dual transmitters and a generator. So driving a remote truck over there and literally hooking directly into the transmitter is an easy option for us. Again, the “what if” scenarios can play out forever, but if we’re assuming that it’s just a lack of power or utilities, I think most all of us here have generators. But if it’s something that physically renders the studio useless (you know, natural disasters, storm, tornado damage, what have you), I think most radio guys could get on the air from their transmitter by some means if necessary.’ (TB – B)*

> *‘….But TEMA (Tennessee Emergency Management Agency), the local emergency management agency, or something would issue some type of identification to the radio and television people that’s necessary to get to transmitter sites. Now when these are being manned by police officers,*

> *sheriff's deputies, and sometimes even the National Guard, most people don't know you from Adam. …….We've never gotten this worked out, but that's one of the things that needs to be resolved, not only in Tennessee but some other states.' (BW – B)*

Meteorology focus group participants indicated an improved level of preparedness by way of the use of the station's satellite truck to conduct the newscast, in view of severe weather impact on the broadcast television station's ability to broadcast a signal.

> *'….With the most recent event back in the flooding of 2010, we were fortunate that the studio was okay. However, the newsroom was being flooded, so we were actually having to evacuate our newsroom while we were on the air. As a matter of fact, this is how crazy it was: they were telling me in my ear, "Let's go to the video of north Nashville; let's go to the video of East Nashville; let's go to video of Antioch; now let's go to video of the newsroom." I'm thinking, "why are we going to video of the newsroom?" And it's because it was flooding at that point. So we were actually out of our newsroom for a year. Now, fortunately other parts of the station are above newsroom and basement level, so we were able to stay on the air. However, because of the great engineering staff, there were still things that had to be done behind the scenes to make sure that we were able to kind of bridge it all together. Then you go back to 1998 when the tornado hit downtown Nashville. So we were actually knocked off the air for about 90 minutes, and once we were able to get back on the air, we're not doing it in the studios of Channel 5. We're actually doing two different broadcasts: one where [RH], our chief, and [CC] are actually broadcasting from our transmitter to people over the air. Then there's actually another crew at Comcast providing information to people who are getting just cable information. And until they were able to bridge those two together, we actually were doing two separate broadcasts without our weather equipment, trying to get weather information on the air.' (LSM – M)*

In addition, broadcast stations noted the presence of emergency generators with sufficient fuel to run for several days. Contingency planning also included issues such as improvements in digital television and cable carriers; specifically, the capability of broadcast media to push signals through fibre optic cables, with most of the public receiving the television signal through a cable provider.

Broadcast media focus group television station participants suggested having a working relationship with a sister radio station to provide an avenue to convey news and updates to the community during a severe weather event.

> *'At our facility, our studio is on generator power; everything in the building will run on that generator. Our technical facility is on the UPS (uninterruptible power supply) – keeps the station operational for the nine seconds until the generator comes on. Our transmitter site is on a generator. The studio site will run for about two days on fuel. The transmitter site will run for about four days on fuel, assuming it was full to begin with, and the transmitter runs everything that's important. Transmitters, fans, some air conditioning – that's on it, and some that's not, so we have to be cognizant and attend to the cooling needs of transmitters when we're running on generator. But as far as staying on the air, we can definitely stay on the air.' (GP – B)*
>
> *'For my radio station, we would love to have a relationship where we could pick up a Nashville television station. But since we've gone digital, we're 50 miles out and a digital signal is a challenge at our facility right now.' (DC – B)*

Broadcast media respondents, as mentioned, had contingency plans in place to address infrastructure issues and broadcast media stations maintained arrangements with at least one local fuel provider, as mentioned below.

> *'Our arrangements are very similar. Our arrangements are with fuel providers. We have two we currently purchase fuel from and we have a standing agreement that they will service us and we have not entered in any written agreement. We discussed it and generally it's the fuel companies who balk and say, even if we bought a whole truckload of fuel and had them store it for us…..' (GP – B)*

With emergency operations centres potentially operational for approximately seven days and with emergency generators to power the entire emergency operations centre, preparedness levels were ascertained to be appropriate. Additionally, members of the emergency management focus group stated that memoranda of understanding in place with petroleum facilities provided the assurance of additional fuel, if needed.

> *'One-and-a-half weeks on generator. About 80% of our building is on generator. Everything critical is on generator. Our fuel was at the ready in 2006, we commandeered a truck and sent him to the emergency operation centre (EOC) just to make sure everything was good the second night in, everything was ok but that is how it rolled.' (KW – E)*

> *'Entire facility covered by generator; should run inclusively for seven days. We have a Memorandum of Understanding (MOU) with a local petroleum facility delivered at given notice.' (TH – E)*

Theme: Disaster training

Some participants of public focus group 2 had received disaster training whilst at work. However, most of the participants of this focus group did not have any form of preparedness training available to them.

> *'Emergency preparedness education - that would be almost entirely from work. Again, I work for the county. I've been to some classes, some management classes, and they do a really good job of management classes. As far as classes for the employees…' (BT – P2)*

> *'I've never seen anything in our work place that would involve family. The only other source that kind of information comes from the same friend that talked me into getting that emergency back-pack, and she always has a wealth of information and I've learned a little bit from her.' (BT – P2)*

> *'Definitely, almost all of mine came from the firefighter / EMT training.' (CB – P2)*

> *'I think the average adult that doesn't work in the field isn't getting it either, like [BH] said, at work, where I don't get it. So it's…I think there is some disaster management training and knowledge available from the Red Cross and otherwise for me, it's online or from TV.' (JD – P2)*

Broadcast media focus group participants indicated the presence of emergency response plans in place for their respective stations. However, broadcast media personnel had very little disaster training themselves.

> *'…..We all have some type of disaster plan in hand. But you know the things that would take a television station down completely is a loss of the transmitter facility, and generally that involves a major fire or the building collapses or the tower falls. Now I've been very fortunate and never had any of those things to happen. But I used to keep a list – and, in fact, this was part of our disaster plans: Who do you call if you lose the tower? Who do you call if you lose the antenna? If the tower falls and it's not on top of the building or gone through the building, now what? So we just keep a list of scenarios like that. But, as somebody said a minute ago, the digital situation has compounded the problems involved with that, because you are going to have those encoders and everybody's playing with servers now and it's difficult to unrack a server and get it out to the transmitter site. And you know you've got to be realistic: there are a lot of radio and television facilities where the studios and transmitters are located at the same place. So that compounds the problem further.' (BW – B)*

> *'We don't have any annual preparedness training.' (DN – M)*

Broadcast media in most communities within the state of Tennessee were engaged in some type of severe weather educational/outreach programmes for the public. Some of the stations had developed programmes to promote the use of the NOAA Weather Radio. Other stations provided seasonal severe weather educational programmes to various communities within their listening/viewing areas.

> *'We do a couple of things. One of the big things that we have done lately is #1 through the weather vendor Midland Radio, we provide NOAA weather radios that are offered. ……..And so the deal is, we go out and go to different cities, especially in spring severe weather season, and maybe a few more here and there in fall severe weather season. ….However, if you're somebody trying to read the instructions for the first time, especially for older people, it can sometimes be a little intimidating.' (LSM – M)*

> *'We do public appearances weekly, and the topic is almost always severe weather and how we cover it. During severe weather coverage, we*

constantly broadcast "what to do" to our viewers when severe weather is in the area (take cover in a basement; if no basement, interior hallway or closet; if outdoors, get into a ditch, ravine, or low area; etc.).' (DN – M)

Theme: Emergency drills

The majority of the public focus group 1 participants indicated having participated in disaster exercises within their community, whilst public focus group 2 participants stated they had participated in a disaster exercise at work. Most public focus group participants had taken part in a fire drill.

> *'They have a drill here every month, so I guess about a week or two ago.' (MM – P1)*
>
> *'I have at work, not in my neighbourhood.' (BT – P2)*

Broadcast media focus group respondents indicated that most had not taken part in severe weather exercises with the first responder community.

> *'I don't remember from a technical standpoint maybe our meteorologist have done something with the weather service, but cannot remember the last time anything like that has occurred here.' (BW – B)*
>
> *'I've been in my current station five years and ten years in the same market at my previous stations, and I can't recall a single experience. I think that would be initiated by the city or state and to my knowledge we haven't had any preparation or testing.' (GP – B)*

One individual from the meteorology focus group, however, had hosted a storm spotter course conducted by the National Weather Service.

> *'We hosted a severe storms spotter course from the National Weather Service a few years ago. Our news department has covered emergency exercises, but not participated in them.' (DN – M)*

Emergency management focus group participants expressed the view that severe weather exercises tested the emergency managers' capabilities and capacities to respond to an incident within their area and, consequently, most county emergency managers had not taken part in a severe weather exercise.

> *'We haven't participated in any exercises. All of our activity over the last few years has been live events, which qualifies as an exercise.' (TH – E, EH – E, JJ – E, PW – E, RF – E, and AL – E)*

Theme: Collaboration

Members of the broadcast media focus group stated that they maintained working relationships in collaboration with local and state response agencies. However, a particular participant within the broadcast media focus group expressed concerns about cities that were close to state lines or broadcast media stations that reached across state lines. Collaboration in these types of situations seems to merit additional attention. Additionally, members of the broadcast media focus group raised concerns related to the layering of jurisdictional issues.

> *'Our station, the team of station managers (which I am one) meet with various state and local agencies from time to time. We don't have a regular meeting time or time to go in and do a refresh, but certainly different members of our station management that are active in the community involved in different levels of emergency preparedness and planning and we would like to believe that we have an open line of communication with state and local agencies..' (GP – B)*

> *'In Chattanooga, we probably not done as good a job communicating with our state and local group. Our news department and some folks are better tied to them than engineering, but I feel also because of our geographic location, we're also very challenged. In the Nashville, probably Knoxville, very nice, you can get a relationship with state and local folks, and with the state you've got your viewing area covered. In Chattanooga, I feel*

> *40% of my market's in Georgia. If I go five miles south of my studio, I cross the state line. I'm into a whole new set of names and faces and different state and local departments to deal with, so that is a challenge we have in that we straddle a state line in our coverage area.' (RM – B)*

> *'Our relationships are good. Our news department has relationships with emergency management, fire, law, and medical services. Ours (weather department) is with the National Weather Service and emergency management.' (DN – M)*

A majority of the county emergency manager respondents reported working relationships with broadcast media personnel. Emergency management trusted in the broadcast media to provide accurate severe weather information.

> *'I have a relationship with all of them. As far as accuracy goes, they are as accurate as they can with the data that they have to work with. That's all you can expect.' (TH – E)*

In response to a severe weather event, assistance from various other agencies, non-governmental agencies and the private sector may be needed by emergency management groups. As such, the emergency management focus group participants stated they had memoranda of agreement in place between neighbouring counties for the purpose of sharing information and resources. Some of the emergency management focus group participants expressed concerns with political obstacles where others did not have the same issues between jurisdictions.

> *'Wayne County. We have a unique situation. When 911 has an emergency, they call me. It's just the way it is; I don't know why. All of our emergency services have policy to share information back and forth, so we all use the same radio system and all use the same warning devices. We're all signed up for the same thing. We don't have the political problems that you have, where one city doesn't get along with the other. They have their own internal squabbles, but when it comes to response to emergencies, it's the same as one.' (EF – E)*

> *‘For Williamson County, we do the same thing. We include Spring Hill. They will get double-covered because of the population and the City Hall. They are on that county line. The agreements are in place in terms of when those weather warnings come in and public response agencies are notified and the community. And like [KW] said, we are days ahead of that, so we will do a situation report to let other players and other county / city officials know that there’s impending weather approaching.’ (MP – E)*

Theme: Back-up Communication

Secondary communication capabilities enabling, broadcast media staff to communicate with the station during severe weather events, was identified as a cogent form of back-up communication. Some participants in the broadcast media focus group maintained two-way radio communications with the broadcast stations, although some of the participants within this focus group were not able to communicate with their control room or studio if normal communication channels were down.

> *’As far as contacting the studio if phones are down, we have two-way radios on several different systems that we’re able to use. All of our remote vehicles have it; all of my engineering personnel carry one; several of our news staff have one. So that’s fairly easy for us to do in the event that our telephones are down.’ (TB – B)*
>
> *‘First of all, we can’t communicate with our control room or our studio if all telephones are down because we’ve basically given up all the two-way equipment.’ (BW – B)*

Theme: Credentials

The need for emergency management to develop and distribute standardized broadcast media credentials (identification cards), to identify staff from news organizations, was an issue presented by members of the broadcast media focus group. This valid identification would be recognizable by the first responder community and would give broadcast media the ability to maintain operations by accessing vital areas.

> *'I've been in that situation before too. In the tornadoes of 2006, if I hadn't actually been before the police in getting back to the site, that site would have been down for many, many hours, because they blocked the whole area off. And that is something that does need to be addressed, and I've talked to [WA] about that in the past.' (DW – B)*

> *'Let me follow up just a little bit on that, if you don't mind. We sat down with Alan Lawson, who heads up the Knox County Emergency Management Agency, about a year ago, a couple of us did. And Alan said, "yeah, I think that I can accomplish this here in Knox County. But what you need to do is to take this course on whatever it is, takes about an hour." Well, there's two or three of us went online and looked at this, and I'll assure you – if you were sitting in a classroom, it might be an hour course. If you were trying to do it on the net, it's more like a full day. And as a result, none of us did this; none of us passed the test. So it's not that we need identification. I think it should be a photo ID, and I think it should identify you and possibly your affiliation. But [TB] has got people that take care of more than just one station, and that's generally the norm today. And all these transmitter sites basically are in isolated areas and they seal those off because they don't want somebody sabotaging communications, because the government's usually got something there as well. So it would be most helpful, and I have the utmost confidence that [WA], that you can talk to the head of the Tennessee Emergency Management Agency and probably pull that off.' (BW – B)*

6.4 Perceived Risk

The risk associated with severe weather events perceived by focus group participants is addressed in this section.

Theme: Public response to messages

Cooperation with evacuation advisories and orders was key in public response to emergency situations. A variety of sentiments and circumstances were expressed and described. The public focus group participants stated they would leave if told to do so by a governmental agency, with public focus group 1 participants stating that assistance with transportation would be a necessity for some. Participants from public focus group 1 also stated that an important provision for leaving would be the accompaniment of pets. Public focus groups 2 and 3 focused on requirement of care for children in evacuation situations, whilst one member of public focus group 3 stated limited knowledge of availability of emergency preparedness due to recent immigration. Additionally, one participant from public focus group 3 expressed concerns about U.S. Immigration and Customs Enforcement.

> *'I would leave, but I would expect to have a place to go to like a storm shelter. If it was too far away, I would expect someone to take me there.' (CM – P1)*
>
> *'I would leave, but I would hope the government would have access to rides to pick the people up, to pick us up from this building to get us out of here.' (MJ – P1)*
>
> *'I would leave, but I would expect some help in possibly taking my pet.' (MG – P1)*
>
> *'Yes, but only with my kids.' (CB – P2)*
>
> *'Are they going to tell you to go to your country? ((He is worried about the US Immigration and Customs Enforcement (ICE))' (AB – P3)*
>
> *'I just came here six months ago and I don't know what is the emergency plan of Nashville. That's why I don't know – I don't know nothing.' (CZ – P3)*

Multiple sources of information impacted on the decision-making process for public focus group participants in the advent of severe weather situations. Public focus group 1 respondents relied on television, while public focus group 2 respondents relied on web links, cell phone applications and social media. Public focus group 3 participants relied on web links and television for severe weather information.

> *'I have my TV on, and when they start flashing about the bad weather, I constantly watch it. And if they say it is coming toward Belle Meade or Bellevue – I'm on the 15th floor; I make preparations to come on down.' (PW – P1)*
>
> *'At that point, it does depend on what I'm doing. If I'm working, I try to get to a place where I can keep an eye on the weather. If I'm not working, I turn on the TV. I turn on the internet and watch it until such time it might be threatening. So far we haven't had one of those threatening events where I felt like I personally had to take shelter. The other thing that I almost always do is get on the telephone and try to gather the crew and make sure everybody else is aware of it and that they are safe.' – JD (P2)*
>
> *'Once I look at the television, I follow the instructions, wait five minutes, and if the warning continues I keep on doing it, and if not I move on.' (CZ – P3)*
>
> *'I do what they tell me on the TV. Also, my children, they have been taught what to do in school, so I follow what they are saying.' (SL-P3)*
>
> *'Once I see the information on the news, I get prepared because I'm scared of tornadoes. And if it comes, it comes, and if it doesn't come, I was prepared.' (AB- P3)*

Emergency management focus group participants indicated an understanding of their role in alerting the general public to severe weather situations. They expressed the opinion that public and elected officials were better able to elicit proactive behaviour by the public as a result of emergency management's involvement. As a result, more protective measures during severe weather events would be taken by the public, with an increased level of self-responsibility. One county emergency manager discussed the issues of public readiness and complacency.

> *'….I haven't gotten many complaints from Public Safety, government officials in the county, but we send out hundreds of emails (or, emails to hundreds of people) – important emails, when we get information that potential severe weather is coming in. The National Weather Service conference calls, I think, have been great. I think they are on target and we try not to put out information that doesn't need to go out, but getting that information out to the public safety and other government administrative personnel is very important and that is something we do.' (KW – E)*

> *'…One of the big things we push is "you got responsibility for yourself. You must bring something to the table, as a citizen. We do what we can, but you have got to do that." We make that pitch to the Lions Club, Kiwanis Club, school groups, and industries – every time we get a chance to do so.' (JJ – E)*

> *'… And I agree with you in the aspect, but at the same time, unless your county has been hit, they just say "it's never happened here, so what are you worried about?" And so in some areas I believe there is a lack of knowledge that they don't want to know because they would have to deal with something….' (PW – E)*

Theme: Vulnerability of population

Participants of public focus group 1 expressed concerns for individuals with limited mobility and they expected assistance to be provided. In addition, concerns were stated about the need to identify safe areas of refuge for individuals who were unable or not allowed to leave, a dangerous situation.

> *'Yes, and also I'm in a wheelchair. I would expect some help with that.' (MG – P1)*

> *'Some people might not because they are handicapped, old, and cannot get up and down.' (KA – P1)*

> *'In answer to [KA]: I would stay on my floor because I am handicapped and I could not do that floor.' (MG – P1)*

The language barrier was cited as a source of vulnerability, with broadcast media focus groups participants indicating limited non-English speaking capabilities. Some participants of this focus group, however, mentioned the inclusion of staff members within their organization for whom English was the second language.

> *'I know we employ some members of our staff for whom English is their second language, or at least they speak more than one language. They are not necessarily on-air talent every day. They are capable of speaking if there was a call, if we had a call to put Spanish content on the air. We have three-four staff members that can fluently speak Spanish, and a couple that can speak Japanese and Portuguese as well. Those are just the three languages I'm aware of. We've never tested that or come up with any plan to do it, but we've got people who can speak other languages on staff.' (GP – B)*

The meteorology focus group participants stated they, also, had limited non-English speaking capabilities. Some of these participants mentioned prior experimentation by their respective organizations with collaboration of Spanish-speaking stations, although that capability no longer exists. There was mention, however, of a NOAA Weather Radio manufacturer that produces weather radios capable of making the initial severe weather notification in English, French and Spanish.

> *'Not that I want to bring politics into it, but there are a lot of different languages. I don't know how you could support everyone. They need to learn English, really. That's the ultimate way to deal with it.' (HS – M)*
>
> *'I know at least one manufacturer now has a weather radio that broadcasts in English, French, and Spanish. They just take the EAS information, so it doesn't give the entire broadcast, but it gives the warning information in any of those three languages. That has just come on the market. The Weather Service does have a Spanish broadcast option on our automated system that creates weather radio broadcasts.' (TJ – M)*
>
> *'You know, I think that is a challenge that we've yet to address as fully as we probably need to. At one point, we experimented with a Spanish language channel – not sure exactly what happened with that, but it's not*

> *there anymore. I think that's an area we are going to have to look at in the future, because right now we don't have, I don't think, any type of infrastructure set up to convey that information to non-English speaking people.' (LSF – M)*

A member of the meteorology focus group discussed the limited availability of the non-English speaking community to receive NOAA alerts/warning in Spanish throughout the United States.

> *'We can get you a number, but it's a handful - El Paso, Texas; Hialeah, Florida; and Coachella, CA.' (TJ – M)*

Emergency management focus group participants also reported limited capability to provide information in languages other than English. One participant of this group, however, indicated having translated disaster preparedness brochures that were distributed in the Hispanic community.

> *'When we do our public education, I have material that is put in Spanish for that. Second, we have a lot of Hispanics in our county, so we go through the radios. There are some Spanish broadcasts there that put out education stuff for them, but I also try to go to specific groups and even if it takes someone translating what I'm saying for them. It is a struggle. It is hard struggle because most do not want to come out and be known.' (PW – E)*

> *'Rutherford County. We don't have a program that addresses that issue. Most of them will scatter when they see a badge on your belt.' (TH – E)*

> *'We have a barrier. We have worked with Cumberland University and they have agreed to assist us with some bilingual work. We haven't had the opportunity to work on the exercise the plan we have in place with them so I'm not really sure it would be effective you never know what a plan is going to do until you put it to the steel of fire. So we don't know but it is a problem.' (JJ – E)*

With regard to ability to hear warning messages, closed-captioning somewhat reduces vulnerability of the hearing impaired. Closed-captioning is a Federal requirement that broadcasters must abide by for the hearing-impaired community. All broadcast media focus group participants from television stations stated that they had closed captioning capabilities.

> *'Generally speaking, our newscasts are all captioned. For emergencies, we have the capability of captioning live and normally we do that in severe weather. We try to make sure we've got captioning or something like that on the screen all the time in the event that it is an incident that affects life and property.' (BW – B)*
>
> *'In Nashville, we live caption all of our newscasts, live caption all of our weather cut-ins, live caption anything that's breaking news. That's just our methodology. It's a big deal to us to take the captioning. We take captioning very, very seriously. We don't do any descriptive content for the blind, so our auditory descriptive content other than what is normally being said or spoken by the on-air talent is non-existent. We are not doing anything that narrates the scene, if you will.' (GP – B)*

Emergency management focus group participants had limited capabilities, however, in addressing the hearing-impaired segment of the community. One respondent mentioned the availability of NOAA Weather Radios having strobe lights and bed vibrators to assist those with difficulty in hearing.

> *'None, other than dispatch.' (EH – E)*
>
> *'There are some weather radios that have outputs for strobe lights, bed vibrators, for various tools, but that sector of the public has to know they exist and how to get them.' (AL – E)*

Theme: Possible danger

It was not uncommon that broadcast media focus group participants put themselves in harm's way during live weather events to report the situation to the public. This reportedly occurred frequently during severe weather events within a community.

> *'I've been in the situation before, and I've been actually watching a tornado as it was on the ground, and working. And, of course, took part of the risk, being able to report it immediately while it was going on. I think, for the most part, anybody that's in that situation, if they've got that capability, are probably going to do that.' (DW – B)*

6.5 Communication Strategy

Communication strategies of focus group participants are discussed in this section.

Theme: Sources of emergency information

Up-to-date severe weather alerts and weather information were received by public focus group participants most frequently via broadcast television but rarely from broadcast radio stations. Public focus group 2 reported additionally receiving severe weather information via emails. Some public focus group 2 participants also relied on cell phones, the Weather Channel and word-of-mouth, but seldom on broadcast radio. Others in public focus group 3 received severe weather information via the internet and television.

> *'From TV. I have my TV on, and when they start flashing about the bad weather, I constantly watch it. And if they say it is coming toward Belle Meade or Bellevue – I'm on the 15th floor; I make preparations to come on down.' (PW – P1)*

> *'I often use a portable device. My telephone, I can get Weather Channel information from. And where I work, anytime there is an alert or warning, we get information through our email and that information is usually passed around by word-of-mouth among the employees. And I get*

information from my computer if I'm at work or at home, rarely by radio, sometimes by radio.' (BT – P2)

'I do it through the internet or TV.' (MQ – P3)

A number of participants from the public focus groups stated use of the internet to obtain additional, comprehensive information about severe weather. Most of the participants in public focus group 2 used the internet site, www.wunderground.com. Public focus group 3 participants viewed www.weather.com, Yahoo, MSN and the www.weatherbug.com.

'Yes, I usually go to Weather Underground (www.wunderground.com).' (JD – P2)

'Weather.com or just Yahoo or MSN.' (MQ – P3)

'Sometimes on TV, sometimes the little icon on the computers (www.weatherbug.com) and sometimes on the iPhone.' (CM – P3)

A lesser number of the public focus group participants indicated usage of an iPhone (cellular phone) to receive severe weather information. The Weather Channel, Weather Underground and Apple weather applications were consistent responses across public focus groups 2 and 3.

'I use the weather channel app on my iPhone and if I'm on the computer, I usually use Weather Underground.' (BT – P2)

'The one that comes with the iPhone. I think it's the Apple weather.' (CM – P3)

A majority of the public focus group participants watched Channels 2, 4 and/or 5 in the metropolitan Nashville area for information regarding severe weather updates. A member of public focus group 1 stated the view, however, that the public likely does not understand the reds, blues and wind shear graphics. The same respondent stated that community sirens are confusing because they emanate from different directions. Alternatively, a member of public focus group 2 stated rarely watching television, instead receiving severe weather information from public radio. Public focus group 3 participants also indicated a variety of radio stations listened to for updates on severe weather.

> *'I get it from 5 and 4 and 2. But sometimes they are confusing on the channels and that's when they get like they do and harp on it constantly when there is not a tornado but they said there's a radar indicating (but not done by a radar spotter). And also said that "the reds and the blues and wind shear" and stuff like that, and it tells them about the wind shear, but some people don't understand about all of that. If they could break it down and make them understand…plus when they warn people, the sirens go off over at Vanderbilt also, and some of the sirens are confusing because they come from different directions and some are different from what they are....' (GS – P1)*
>
> *'I hardly ever watch television, so it would be very rare that I get information from television. I listen to public radio almost exclusively, so that's where that information would come.' (BT – P2)*
>
> *'When I am driving and I see that the sky is getting dark, so I will turn the radio on and try to find something. I don't have any particular radio station. While I'm at work, they will send emails with warnings, alerts or something like that, or I just go the internet and Google it.' (LS – P3)*

The general public as a whole was predominantly dependent on broadcast meteorologists to alert/warn of severe weather with potential to significantly impact the community. Whilst some of the general public indicated use of text messaging or the internet for severe weather information, members of the meteorology focus group were of the impression that the general public preferred to receive severe weather information from broadcast meteorologists in or near their community.

'Well, I think it's very important to them, seeing us on television and showing them what's going to happen. And when we're not there and there's a thunderstorm, even if it's not severe, they are calling, wanting to know why we're not on the air. So I think that they expect us to be on the air and telling them what's going on. And there is some confusion and because they do think, not everybody, but there's a certain section of the population that thinks that warnings originate with us, and which we try to explain that that's not the case - we're relaying that information. Hopefully we're enhancing the information through visuals, but I do think it's very important to people who watch. They do expect us to give them that information.' (LSF – M)

'I agree, because people can meanwhile read their texts and go to the internet. They want to see a face that they trust interpreting what is headed their way. They know that all of us have been here, know what's going on. We can best explain to them what's coming their way and know what to expect.' (BS – M)

Social media (Facebook, Twitter, etc.) was thought by meteorology focus group participants to be a rapidly growing tool to facilitate two-way public communications, although some of the respondents reported that a majority of followers on such social media were the 'younger' crowd.

'You know I don't know if we've ever done research to say what percentage. I think that percentage is growing, particularly among the younger crowd, because we do get a lot of response from social media. When you post to me, they write back and they want to have a conversation, which is sometimes difficult during severe weather. But I wished I could give you a number, but I don't know if we've done any studies to say what that percentage is. But it is a growing percentage of our audience that communicates that way.' (LSF – M)

'Telephone alerting, texting, Twitter, and Facebook are all areas we are getting into.' (DN – M)

'Yes, and we've actually gotten some good storm verification in there. The more that I learn about Twitter, the more people I talk to, in terms of information, it's got to be a two-way street. The Twitter service that we are going to at least partner with on a pilot basis here is called NashSevereWX.com and that's his website, and NashSevereWX is his Twitter feed. He's got an incredible following, people in Williamson and Davidson County. So we're giving him pictures in real-time of the flooding in Cool Springs two weeks ago. I've seen pictures that are 45 seconds old on his page. It's really amazing stuff that's out there. So we're going to try to get some kind of coordinated effort where he provides his followers with

> *some general "Where is the storm now?" and he's going to have access to our chat and he's going to be coordinating with us. And in the meantime we're all going to have access to his Twitter feed, which you will all have access just like we do, and he will be putting pictures in the chat room from Williamson and Davidson as a pilot to try and get some handle on this incredible amount of information that's out there all the time.' (TJ – M)*

Participants in the broadcast media focus group indicated receipt of up-to-date severe weather information from a variety of sources: NOAA Weather Radio and Weather Service International, in particular.

> *'Weather alert radios are an extremely good source.' (DW – B)*
>
> *'We get weather alerts through our WSI (Weather Service International) weather systems, as well as through our NOAA (National Oceanic and Atmospheric Administration) weather connection through our EAS equipment.' (RM – B)*

Members of the meteorology focus group also indicated receipt of up-to-date severe weather information from a variety of sources, as well: Weather Central, Associated Press (AP) and the National Weather Service (NWS) Chat.

> *'We get NWS alerts via our vendor Weather Central, Associated Press, and NWS Chat.' (DN – M)*

Emergency management focus group respondents indicated up-to-date severe weather alerts and weather information originating primarily from the National Weather Service. In some cases, emergency managers gained knowledge of severe weather impacting the community by participating on National Weather Service conference calls.

> *'National Weather Service' – (TH, EH, KW, PW, JJ, SS, RF, CH, HK, JW, CC, MP and AL-E)*

'Once we have the National Weather Service conference calls or whatever come out, we put that out via email and dispatch from our 911 center. We'll also put out when there's warnings in the area.' (PW – E)

Theme: Effectiveness of messages

Most public focus group participants understood the basic concept of a "tornado watch" but were unsure of differentiation in terminology between that and a "tornado warning". Some participants stated they actually went outside to see what the weather looked like.

'I think they mean, by tornado watch that conditions are likeable for a tornado, so they will scan with the satellites and radar.' – (CM - P1)

'You have to watch for the signs of clouds forming and see if there might be a tornado.' (MQ – P3)

'For me, it means that strong winds are coming and we have to be alert on the developing of it.' – (LS - P3)

Whilst all three of the public focus groups expressed confusion between "tornado watch" and "tornado warning", generally, participants of the public focus group generally understood the meaning and intent of a "tornado warning". A member of public focus group 2 stated that upon hearing "tornado warning" it was time to stop what they were doing and take appropriate actions.

'*Lets you know that the weather is favourable for a tornado and to keep watching the news.*' – (PW - P1)

'To me, warning means one is definitely spotted, reported, and that means I'm ceasing everything I'm doing and pretty much constantly watching the radar.' – (CB - P2)

> *'If I hear a tornado warning…If I'm at home, I would go grab the weather radio to get more details because I would assume it's going to be more severe than just the watch.' – (CM - P3)*

> *'For me, the confusion is if I'm watching or listening to commercial radio, commercial TV, I know they give specific information because they're commercial channels. They start describing something else, like something is in a different neighborhood, surrounding county, and that either distracts me or confuses me about what is specific for my area. So if I think it's real important I go and grab the weather radio, which is basically specific to your location, or I know now there are apps for emergency warnings. I don't have mine installed but I would do that, only the commercial broadcast.' (CM – P3)*

> '*I may sound ignorant, but I just realized that there is tornado "warning" and tornado "watch" – never paid attention to it, sorry. And, yes, I think MQ is right when he says that the colors help much more because you pretty much, you are following what is nature – goes from something that is weak and goes to something that is very strong. And what CM says that sometimes it can be very confusing while you're watching TV because they are pointing out somewhere else and you don't know if it's happening somewhere else.' (LS – P3)*

In an effort to keep communication strategies current and thereby provide effective messaging, members of the meteorology focus group expressed the opinion that the current Emergency Alert System (EAS) was in need of updating. One participant discussed the use of technology to improve the presentation on television. This individual also reminded the group that after a major disaster, NOAA Weather Radio with batteries potentially could be the only communication device available to convey information to the general public.

> *'I think a lot of what needs to happen over at EAS is in the works. Transition to digital, with EAS something that is common alert protocol, in terms of message formatting. I think the real thing is getting a system that can get warnings out to everybody no matter where they are and this is a big part of it. Weather radio is a big part of it. Traditional media is a big part of it.' (TJ – M)*

> *'TJ is exactly right - everyone has their cell phone on all the time. It's a very good device to get weather information from, except when there's a major disaster and bandwidth restrictions prohibit you from getting it at all.*

So that's not a viable technology either. So the only one I think is now operating that is a viable technology is the crudest one of all and that's NOAA weather radio, because it requires nothing more than a battery-operated simple receiver and it's over the air. There's no internet, no Verizon, no Comcast, no intervening technology. So I think we need to keep that in mind as we go down the road with our pretty pictures and our wonderful technology, that if we have a major disaster like Hurricane Katrina, it's going to be reduced to rubble and we better not throw away things like NOAA weather radio that are always going to work.' (RH – M)

'Since we have the alerts put to air by our computer from the vendor Weather Central, the EAS is more of a back-up for us.' (DN - M)

Meteorology focus group participants expressed the opinion that the National Weather Service had improved its capabilities with an improved radar system. However, they stated that the EAS with a grey screen that stated "tornado warning" was ineffective.

'This is the biggest problem. However, it is part of the science. The NEXRAD Doppler radar can almost always spot the circulation in a storm for a tornado. However, it can't tell if it is reaching the ground. NWS has no choice but to warn any area in the path of these storms. Even if a spotter sees the rotation not reaching the ground, it could be on the ground in seconds. NWS is not crying "wolf." It's just the nature of the beast. That's why remote cameras and spotter reports are so important.' (DN – M)

'Well, I certainly don't think the Weather Service has cried "wolf" too many times. I think there is a problem with false alarms, a kind of numbing response. I think it tends to be cyclical though. I think no one in middle Tennessee is going to ignore a tornado warning right now when the vivid pictures of Tuscaloosa are in their minds, Birmingham and all those other towns that were hit, even though that wasn't here. But occasionally we'll go through several years without any violent tornadoes in the Southeast, and then I think maybe public response weakens. But we would like to have a perfect tornado warning system, but I don't think that causes lack of concern. I don't think people do not respond to tornado warnings because of previous false alarms.' (RH – M)

6.6 Conclusion

The study reviewed the capabilities, challenges and shortcomings associated with the sender and receiver in the process of informing and educating the public regarding severe weather events. Understanding, knowledge and prior experience of disasters were significant factors influencing the public’s decision-making process. In concert with the increased awareness of comprehensive alerting/warning systems existing in their communities and enhanced situational awareness, information from broadcast media and emergency management was shown to have educated the public more effectively about appropriate actions and behaviour for preservation of life.

Chapter 7 - Discussion Section

7.1 Sample Characteristics

7.1.1 Quantitative Sample Characteristics

During the three years the study was conducted (2007, 2008 and 2010), responses to the questionnaire survey varied in number between 2,207 responses in 2007 and 1,375 in 2010. Although a variance existed throughout the period, a total of 5,794 survey respondents participated in the public web-based survey over the survey time period. As this was a web-based survey, it is acknowledged that it was not possible to calculate the response rate (Dillman et al., 2009a).

The demographic information from respondents showed participation from diverse segments of the community. The higher proportion of people aged 45 to 50 (30.1%) responded to the public survey. A significant increase in the number of public survey respondents between the ages of 55 to 64 was noted over the study period, from 20.9% in 2007 to 27.0% in 2010. Number of people per household ranged from one to four or more among the public survey respondents. 37.8% of the public respondents reported having two persons per household. Study results indicated an average of 2.55 people per household. Within the state of Tennessee, during the same survey period, the average number of persons per household was approximately 2.49. Throughout the United States the average was 2.59 people per household (USCB, 2012a). The income levels of the highest proportion of respondents to the public survey ranged from $50,000 to $75,000. This range was found to be greater than the $51,914 average income of residents of the United States (USCB, 2012b).

Residents of the state of Tennessee reported average income of $43,314. It is assumed, therefore, that the average income of the state respondents surveyed was higher than the U. S. average.

A consistently higher number of females (59.6%) responded to the public survey than males (40.4%), with the majority of the respondents being Caucasian, college educated females earning $50,000 or greater on an annual basis. According to the 2010 U.S. Census, females represented an average of 51.3% of the population within the state of Tennessee, whilst the average of females throughout the United States was found to be 50.8% (USCB, 2012b). A significant decrease occurred in the respondents from the Native American/Alaskan Native female population during the three year study period. The study showed the percentage of Hispanic/Latino males (who participated) fluctuated over the course of the study period, from 3.5% in 2007 to 0.9% in 2008. The research by Hayslett et al., (2004) indicated that internet surveys have a higher response from Whites and Asian Americans than from Black and Hispanics.

Included in the broadcast media survey responses were received from 60% of the television stations within the state of Tennessee, as well as 18% of radio stations within the state. It is acknowledged that the respondents from the broadcast radio stations survey were actually representative of entities of larger corporations, with 42 corporations comprising the radio group ownership (Mackenzie, 2013). Accordingly, the percentage of individual radio stations represented would have been higher had these large corporations completed individual questionnaires for each of the individual stations. For example, Tennessee broadcast radio corporations typically own multiple radio stations, with three to seven stations on average. Thus, whilst survey respondents on behalf of the corporations completed only one questionnaire, actually they may represent several stations. The total number of radio stations that were represented by broadcast radio corporations is not known.

The emergency management survey was completed by 96.8% of the county emergency managers in the state of Tennessee. The high response rate of these agencies allowed for the development of a comprehensive data set representing the entire state of Tennessee, thereby reducing non-response errors (Archer, 2008). The majority (87.2%) of county emergency managers held paid positions, enabling approximately one-third of the county emergency management agencies to operate on a 24-hour per day/seven days per week basis. 53 (63.1%) of the county emergency management agencies were staffed with one to two individuals, although some agencies had staff of seven or more. Information on staffing levels of emergency management agencies from other states was not available.

7.1.2 Qualitative Sample Characteristics

The three public focus groups consisted of representatives from the general public population. These focus groups were comprised of the public-at-large, low-income government housing respondents and members of the Hispanic community. Although it might be presumed that greater difficulty would have been experienced in surveying populations of these lower-income government housing and Hispanic communities due to ethnic differences, social class and cultural issues, this was not the case (Hayslett et al., 2004). Throughout the study span, the recruitment of individuals from the low- income and Hispanic communities for participation in these focus groups presented no difficulty. Conversely, it was found that the public-at-large respondents were found to be more difficult to access or to obtain participation in the groups. Several community groups in the middle Tennessee area (i.e., faith-based, civic, non-profit and community groups) were contacted to participate in the project, with acceptance by one church group. This study has confirmed the observations of Lowndes et al., (2001) and demonstrated the whilst the desire existed on the part of the public to share their experiences, few were willing to commit to involvement in a research project due to time commitments and conflicts with other ongoing activities.

The broadcast media focus group consisted of management personnel from both radio and television stations, representing each of the three regions of the state (west, middle and east).   Better collaboration and improvement of relationships with associated radio stations was a need expressed by participants of the broadcast media focus group in order to enhance the ability of broadcast media to deliver news and situational updates to the public. Thus, enhancement of these media relationships/partnerships would assist in establishing alternative arrangements for conveying information to the general public if the event emergency generators failed at broadcast television stations or on the part of cable providers. Broadcast television would then have capability to communicate with broadcast radio stations via landlines or by direct in-person contact with the broadcast radio stations.

The meteorology focus group represented 100% of broadcast television stations in the Nashville, Tennessee area. In addition, the National Weather Service was represented. Participants of this focus group expressed the existence of an excellent working relationship among television meteorologists and the National Weather Service. Issues of key importance noted by this group included the impact of television ratings regarding content and subsequent timing of on-air presentations, the role of social media and the manner in which it is utilised by broadcast media, as well as various details regarding existing notification systems in use by broadcast media. In particular, it was noted that a particular form of notification, the opt-in alerting system, had low public enrolments. Utilisation of mobile devices to alert the general public is increasing due to efforts of the federal government to implement the Integrated Public Alerts and Warning System (IPAWS). This system upgrades the Emergency Alert System (EAS) (FEMA, 2012c).

The emergency management focus group represented urban as well as rural county emergency managers. The Tennessee Emergency Management Agency (TEMA) participated in this focus group. Investigative results of this study indicated the presence of a fine working relationship between county emergency management agencies and the state emergency management agency. Although limited alerting capabilities were found in rural counties as a result of limited funding, NOAA Weather Radio was noted by this study to be one of the most effective alerting systems and is currently available for alerting/warning the general public (Collins and Kapucu, 2008).

7.2 Knowledge and Experience

Historically, severe weather events have caused significant damage and loss of life across the United States, resulting in large economic loss to the impacted communities. This investigation confirmed the observations of Boustan et al., (2012) and showed that natural disasters have caused appreciable property damage and death: during the study period (2007, 2008 and 2010), a total of 105 tornadoes were reported within the state of Tennessee, causing $284,688,700.00 in damage and 32 lives lost (NOAA, 2012d).

These surveys revealed that, of those public respondents who had experienced a natural disaster, better preparedness was exhibited for future disaster possibilities. Whilst 49.8% of these public survey respondents had experienced a tornado and an average of 20.7% had experience of flooding, the study identified trends in which the number of public respondents who had experienced tornadoes decreased and the number of public respondents who had experienced flooding had increased. 46.2% of the survey participants reported experiencing loss of electricity due to a disaster for at least three days, whilst 28.2% had to leave home for at least one night. Also, during the three-year period of the study, 8.5% of the respondents were forced to evacuate the community. These results concurred with the research of Han et al., (2009) and stressed the importance of having plans and procedures in place to address power outages caused by disastrous events.

Even so, several disasters of immense proportion have had an impact on the United States in recent years, notably, Hurricane Katrina in 2005 (Burby, 2006) and Hurricane Sandy in 2012. Experiences of the general public in the New Orleans area as a result of Hurricane Katrina included electricity outages for a period of approximately two weeks, with flood waters inundating the New Orleans area and impacting transmission stations. Hurricane Sandy impacted on the New York/New Jersey shores area of the country and, again, the general public lost power in many areas for an extended period of time-up to several weeks in some locations. These instances highlight an important finding from this study: the frequency of the loss of electricity as a result of severe weather conditions. Consequently there is a need to construct more resilient electrical grid systems throughout the United States which are able to withstand such area-specific threats.

Severe weather potential and resultant damage caused by tornadoes was an important subject of investigation in this study. It was found that the general public followed recommended procedures when weather conditions were favourable for the development of tornadoes. These procedures included the issuance of a tornado watch by the Storm Prediction Centre (SPC) and a subsequent tornado warning issued by the National Weather Service upon sighting of a tornado. Additionally, a warning is issued when thunderstorm circulation indicative of tornado formation appears on radar. At such times, it is considered imperative that appropriate, timely protective action be taken (Golden and Adams, 2000). Information gained from this study indicated that knowledge and prior experience of severe weather emergencies had a large impact on an individual's decision-making process. Specifically, the study noted significant differences in the responses of public survey participants with and without prior exposure to tornadoes. The study found a strong correlation between having had prior severe emergency situation experience and better preparedness on the part of individuals for potential disaster events. Contributing to respondents' better levels of preparedness were such factors as the need to be self-sufficient, having had prior emergency experience, as noted, and the responsibilities of caring for children and elderly/disabled persons. The research by Paton and Johnson, (2001) compared similar issues correlated to increasing awareness and risk perception related to public education, vulnerability analysis and community resilience.

Ascertained through this study of the broadcast media was evidence that advance notices of severe weather were received by the media from NOAA Weather Radio and from the National Weather Service (NWS). Policies and procedures implemented by broadcast media were then followed to alert the public of the imminent threat of severe weather, as well as of non-weather events (Amber Alert and hazardous materials) having potential to impact the viewing/listening audience. Additionally, members of the broadcast media and meteorology focus groups provided details of the use of alternate types of technology employed to reach the public. Specific examples included television broadcast, closed-captioning (text for the hearing-impaired), social media (Facebook and Twitter) and crawls (subtext on the television screen). The observations of Rodriquez et al., (2004) supported the perception of study respondents that such communication of potential threat to the public in a timely manner was vital, thereby assisting in saving lives and property.

The findings of Rudman et al., (2007) validated that contingency planning and preparation for the impact of severe weather events could enhance broadcast media's capability to provide news and information to the public before, during and post event. In reviewing the capabilities of broadcast media, most television stations throughout the state of Tennessee relied on emergency generators for emergency back-up power, with the capacity to run two to five days. Only 29 (65.9%) of the radio stations had emergency generators for back-up power. All of the broadcast television survey participants (100%) had emergency generators located at their facilities, together with additional back-up generators at the television transmitter sites. Both facility and transmitter sites were capable of running, on average, for four days. Standing agreements were maintained by the television stations with fuel suppliers for the provision of emergency fuel supplies, thereby allowing broadcasters to provide continuous news and updates to the public.

Development of such relationships would improve the functionality of the stations' delivery of news, weather and news advisories, wherein the general public would be able to receive a broadcast radio signal via battery-operated or car radio, even when critical infrastructures (cable and electricity) have failed. This potential concern was noted, despite the Federal government not requiring broadcast radio stations to have emergency generators. This study revealed that only 29 (65.9%) of the radio stations that participated in the survey had emergency generator capabilities. The research of Scanlon et al., (1985) discussed the broadcast media's ability to survive a disaster with access to emergency power if in a high threat area. However, all primary entry point (PEP) broadcast radio stations are required to have emergency generators, with funding supplied by the federal government for acquisition and maintenance of these PEP stations generators, as well as the additional related equipment required. The PEP stations could then function as the primary means of delivery, to the general public, a Presidential or National Emergency Alert System (EAS) message (FEMA, 2012d). There are two PEP stations within the state of Tennessee, and 77 PEP stations throughout the United States, all of whom have completed required applications to volunteer to become a PEP station. Once approved by the federal government, these stations are provided assistance to acquire the necessary equipment to provide emergency information to the public during infrastructure damage or failure (Moore, 2006). Both PEP stations within the state of Tennessee were found to have emergency generators.

Data obtained from results of the emergency management survey indicated that 84.9% of emergency management agencies maintained emergency generators to supply back-up power to their offices, as well as to the emergency operations centres. These emergency management agencies had sufficient fuel, on average, to last for seven to ten days. Agreements with suppliers, noted previously, generally are in place to allow additional fuel to be brought in as needed. The presence of these emergency generators and back-up fuel supplies allows emergency managers to maintain an adequate, functional EOC during a power outage. This study substantiated the observations of Lindell and Perry (2007) and confirmed that contingency plans on the part of emergency management are required to be properly in place in order to address, adequately, infrastructure failure as the result of a disaster or other event. These protocols should address emergency power status and requirements for the emergency operation centre. As an example of such protocols in an area-specific target, the Federal Emergency Management Agency (FEMA) has developed and implemented mitigation plans and projects to enhance the resiliency of the Gulf Coastal area of the United States to protect the region from hurricane storm surge. However, sustainability of the existing power grid and other critical infrastructure are still a concern (ASCE, 2009).

The operations and procedures of state and county Emergency Alert Systems were a focal point of this research. It was found that various, alternate plans are in place to allow emergency management to communicate severe weather threats both to the public and to the broadcast media. The sharing of this information has typically been communicated via an emergency operation centre (EOC). Within the state of Tennessee, 84.9% of county emergency management agencies maintained emergency operation centres. As stated by members of the emergency management focus group, incident coordination could challenge any emergency management agency. Thus, the EOC provides a location to coordinate the planning and response efforts of the various departments and agencies, private sector, volunteer agencies and other interested parties within a reasonable amount of time. Information provided by this study confirmed the findings of Militelo et al., (2007) that resources and logistical requirements are managed by emergency managers and other response agencies from within these emergency operation centres. Additionally, the emergency management focus group provided data which demonstrated the sharing of critical information with government officials and response agencies by the emergency operations centres.

7.3 Community Warning Systems

There are numerous ways in which the public receives alerts/warnings with modern technological capabilities, essentially since the onset of Commercial Mobile Alerting System (CMAS)/Wireless Emergency Alerts (WEA), internet websites and SMART cellular phone applications. Over the three survey years an average of 77.1% of the public respondents reported having community sirens in their area and placed additional reliance on broadcast television (48.6%), broadcast radio (12.0%), NOAA Weather Radio (4.5%) and cellular phone applications (5.9%) to provide information regarding severe weather. Obtaining such information from multiple sources allowed the general public to make better informed decisions about the protective actions that should be taken to protect themselves and property. It was found, however, that some participants within public focus group 3 (Hispanic) were unaware of the capabilities of a NOAA Weather Radio. This information lends support to the Benavides et al., (2010). Thus, there is a need to increase the capabilities of alerting/warning the Hispanic community. This study has found there exists an urgent need to educate broadcast media and emergency management agencies regarding the most effective way to convey/receive severe weather alerts/warnings to those in non-English speaking communities.

Data provided by the broadcast media survey indicated that community sirens were found in only 53.3% of the radio stations and 42.9% of the television stations listening/viewing areas. Survey results of broadcast media respondents regarding community warning systems were varied. Of particular concerns were limitations regarding the effectiveness of outdoor warning sirens. It should be noted that limitations are inherent in the design of the community siren warning system itself, as it was initially designed for general notification to the outdoor public to seek shelter (Sorensen, 2000). This warning system originated during the cold war period of the 1950s and is not a modernized system, although advancements have been made through adaptation to warn the public, both of natural and man-made disasters (Botterell and Addams-Moring, 2007). However, as indicated by the emergency management focus group, these systems are expensive to maintain. The research of Sorensen (2000) reflected the preference by emergency management teams of multi-layered warning systems to effectively alert and warn the general public.

Correspondingly, in support of the research by Sorensen, (2000) responses included in this study from participants of the emergency management focus group indicated similar reliance on a multi-layered community warning system to effectively convey information to the general public. With the advent of modernized technology, multi-layered warning systems were found to include advance notices of severe weather received by the majority of broadcast media stations from the National Weather Service (NOAA, 2012a), public utilisation of NOAA Weather Radio, broadcast radio and broadcast television for severe weather alerts and some utilisation by participants within the meteorology focus group of private services to assist with severe weather forecasting.

As found in this study, an array of media/communication devices are included in an integrated alert/warning system having capability of swift notification to the general public. These integrated systems satisfy the need to provide effective communication to the public at all times, in all places, under all conditions and over multiple broadcast media devices (Sorensen, 2000). With much public trust placed on broadcast media, National Weather Service (NWS) and county emergency management agencies to provide and convey this severe weather information, meteorology and emergency management focus group participants expressed reliance on the integrated system of warning.

Whilst giving careful consideration to the fact that technology could fail at any time, broadcast media and emergency management respondents indicated an improvement in capability to alert/warn the public in a timely manner, due to the onset of new radar technology and multiple avenues for reaching the public. An example of such newly developed and implemented technology, the Commercial Mobile Alert Systems (CMAS) allow public-safety authorities to send geographically targeted, text-like Wireless Emergency Alerts (WEA) to public cellular telephones (FEMA, 2012c).

As noted previously, of all the counties within the state of Tennessee, only approximately half were found to have community warning sirens. Greater reliance was found to be placed by emergency management focus group members upon the National Weather Service (NWS) and NOAA Weather Radio for advance notices of severe weather with potential to impact their community. Additionally, county emergency management agencies indicated reliance on county 911 centres (86.6%) and local law enforcement agencies (79.1%), as well as on broadcast media to assist in notifying the public of the severe weather threats. An important role is played by the media in conveying information from the National Weather Service and emergency management to the community (Starbird et al., 2010). This is clearly indicated by responses of the public focus group participants expressing the expectation of receipt of accurate and timely information from broadcast media, as well as emergency management agencies, during times of need.

Whilst the study noted an inclination from the part of the public to develop preparedness plans with regard to the particular type of disaster which most recently impacted their community, some members of the public exhibited a tendency to disregard hazardous warnings associated with the array of other types of disasters having potential impact. This information lends support to the premise of this study that education should continue to be provided to the public by broadcast media and emergency management of the many, varying hazards capable of impacting the particular area. An indication of how well received this information would be might be reflected, however, in the various responses received from the public focus groups. Public focus group 1 (Low-Income

Government Housing) and public focus group 3 (Hispanic) seemed to be better prepared for natural disasters than public focus group 2 participants, even though public focus group 1 depended upon the government for transportation and sheltering. By contrast, public focus group 3 was fearful of the government, which could preclude likelihood of successfully educating this sector of the population. However, whilst education is a fundamental path to protecting the public, this study confirmed that, with the increasing development of radar systems, web and SMART cell phone technology, it is essential that the National Weather Service (NWS) and county and state emergency management agencies continue to expand the networks providing the most efficient and effective systems to protect the public.

7.4 Disaster Trends

Whilst severe weather events are on the increase in Tennessee (NOAA, 2012a), the 5,794 respondents to the public surveys expressed trust in the preparedness of local government to respond adequately to major emergencies that could impact the community. A comparative snapshot numerical value revealed by this study reflects, with a population of 1,698,651 in the Nashville Metropolitan Statistical Area (MSA) (USCB, 2012a), 60.8% of respondents to the public survey were somewhat confident with the level of preparedness of local governmental response agencies. With the rise in the occurrence of natural disasters, there is an increased need for the public trust, as well as public awareness of threats associated with severe weather events (high winds, flash flooding and flying debris). For example, the study found that 52% of the tornadoes within the state of Tennessee were night-time tornadoes (occurring between the hours of 6:00 pm and 6:00 am), presenting a different set of challenges to the community than those occurring during daytime hours. As reported by NOAA (2012b), an increased vulnerability exists for the public during night-time hours. Thus, it is vital that the public be receptive to alerts, particularly at times of heightened exposure.

Research by Grazulis (2001) indicated that lives have been saved through implementation of tornado awareness programmes for the general public and by improvements made in forecasting ability. The media and emergency management focus groups stated that a comprehensive severe weather public warning programme could benefit in improving the public resiliency, by which the public is better aware of the multi-layered alert/warning system and the necessary protective actions that should be taken. The study found a significant trend during the three-year period in which the public grew increasingly confident in preparedness of local government for major emergencies. These percentages were shown to have risen from 9.8% in 2007 to 22.3% in 2010. Factored also in the increased public confidence was a trend, identified in which the public expanded its capabilities to receive severe weather information from traditional broadcast television and radio stations, to include utilisation of electronic media such as email, internet and social media.

7.5 Levels of Preparedness

In order that the alert/warning system be effective, it is important that the public is aware of both the existence of the alert/warning system, as well as its capabilities to communicate messages and information to the community (Collins and

Kapucu, 2008). Moore (2006) reviewed the capabilities of the NOAA Weather Radio and the ways in which it is used to convey warnings of natural disasters, evacuation notices and civil emergency messaging. Findings of this study reinforce the almost universal view that the NOAA Weather Radio is one of the most widely recognized components of a comprehensive alert/warning system. The weather radio, capable of alerting/warning the public 24 hours a day, seven days a week, is a device heavily depended upon for such alert information. However, although the NOAA Weather Radio is a key component of the severe weather warning system, responses from the public survey indicated that, during the three years of this study, only 34.1% of the population had a NOAA Weather Radio in the home. Also, it was noted that respondents from public focus group 2 were apt to store the NOAA Weather Radio in closets, making access to the radio more difficult. Mention was also made of the unpleasant sound emitted by the radio. In an effort to make the device more user-friendly, members of the emergency management focus group participants suggested updating the NOAA Weather Radio from a countywide alert to a polygon alerting capability with a global positioning system (GPS) chip located within the radio. Alternately, however, members of the three public focus groups expressed the view that internet and various cellular phone applications provided more convenient access and better receipt of severe weather information. Mileti and Sorensen (1990a) reviewed in excess of 200 public warning systems and concluded that variations in the nature and content of the warning message impacted the reaction responses of the public to the warning. Correspondingly, this investigation validated the importance of public awareness of ways in which alerts/warnings may be received by the public. Members of all three public focus groups confirmed receipt of severe weather alerts at home via NOAA Weather Radio, the internet, SMART cellular phones and broadcast television. Public focus group 2 participants stated they received severe weather alerts/warnings via the internet and SMART cellular phones whilst at work. Participants from both public focus groups 2 and 3 stated they received severe weather alerts/warnings via the AM/FM car radio whilst travelling and on SMART cellular phones.

It is the recommendation of the Federal Emergency Management Agency (FEMA) that, in order to promote optimal levels of self-sufficiency, all members of the public should have a disaster kit available. A list of supplies is noted on the FEMA website (FEMA, 2012b) and it is suggested that the disaster kit be assembled with the capability to sustain life for three to five days. The research of Tierney et al., (2001) showed that proper preparedness information provided to the general public increased the ability of the public to respond effectively to an impending threat. Similarly, this study also confirmed that having the required disaster supplies to sustain ‘you and your family for a period of time’ was an important aspect of proper public preparedness. Results of the public survey indicated, however, that during the three years of the study, only 36.1% of the participants had disaster kits in the home, 24.7% had disaster kits in their vehicle and 6.8% had disaster kits in their office.

7.6 Community Outreach Programmes Related to Severe Weather

Data gathered from all three public focus groups indicated that public knowledge of the severity of weather events (severe weather watches and warnings) directly impacted the level of protective actions taken. The research by Hoesksta et al., (2011) studied the combined level of understanding and perception of risk associated with severe weather by the public. The findings of this study confirmed that community outreach programmes heightened public awareness of severe weather hazards and the associated need for appropriate protective actions. However, it was also found that only 36.7% of the public had either seen or heard an emergency preparedness message within the prior 30 days. Amongst the varied responses to this topic, members of the public focus groups expressed the general opinion that such public outreach should include an itemization of necessary, appropriate protective actions. It was also expressed by participants in all three public focus groups that a need exists for knowledge of emergency shelter locations. Some participants of public focus group 1 expressed the need for transportation to a shelter. Although individuals of public focus group 2 were inclined to be more resourceful and resilient in caring for themselves, participants of public focus group 3 indicated lack of knowledge of shelter locations, as well as hesitancy to relocate to these facilities. Upon investigating this issue further, it was discovered that the American Red Cross (ARC) manages a National Shelter System with pre-identified shelter locations throughout the United States (AMR, 2012a). The need remains, however, for American Red Cross and county emergency management agencies to educate and inform the general public about these shelter locations prior to a community disaster.

As noted by AMS (2001), community outreach by broadcast media was helpful in informing the public of threats posed by severe weather in advance of the weather events. The use of public-private collaboration was found to enhance the ability of television meteorologists to provide more comprehensive outreach programmes. This was due, in part, to the inclusion of information obtained from both the National Weather Service (NWS) and from private contractors (AMS, 2001). Some respondents of the meteorology focus group indicated participation in community outreach programmes and also mentioned having partnerships with NOAA Weather Radio manufacturers to provide weather radios at reduced prices to the public. Additionally, many television stations encouraged the public to sign up for severe weather text alerts to further the outreach ability. Most television stations also provided severe weather preparedness video clips during emergency preparedness month (September), as well as during severe weather seasons throughout the year. Public appearances were made by those in broadcast media to educate the public of the threats associated with severe weather. Confirmation is therefore made through this investigation that AMS (2001) correctly reflects the longstanding collaboration between the National Weather Service and broadcast media serving the public during severe weather events.

In order to assist further in the development and facilitation of public safety programmes, members of the emergency management focus group have reached out to community partners to assist in understanding the resource and cultural needs of diverse populations within the community. Illustrating this expansion in scope, emergency management agencies have established communication networks for the distribution of disaster preparedness/severe weather information related to disaster shelter facilities, emergency transportation and check-in procedures for seniors living alone. Some members of the emergency management focus group indicated collaboration with Hispanic community leaders to help distribute disaster preparedness information, as well as conducting of disaster preparedness programmes for the Hispanic communities.

A key finding of this research was the existence of the need for increased public awareness and increased public engagement in disaster preparedness activities. It is evident that emergency management and broadcast media have worked together to develop more comprehensive public outreach severe weather programmes. The need is urgent, however, to increase levels at which emergency preparedness information is provided so that communication capabilities for diverse populations are enhanced during severe weather events within the state of Tennessee. To minimize the language/comprehension barrier encountered, some members of the emergency management focus group announced development of disaster preparedness information in Spanish. Also, many participants indicated that disaster preparedness information had not been prepared in any language other than English.

The findings of this study corroborated the AMS (2001) bulletin observations indicating the need to distribute a common severe weather message to the public. Inherent in the views of all focus groups was the importance of comprehensive outreach programmes by emergency management and broadcast media to foster continuing public awareness, understanding, interest and trust. It is suggested, therefore, that the alerts/messages delivered to the general public be brief and precise in advising the public of the impending threat. The messages should include pertinent time information, severity of threat and protective actions that should be taken. All means should be taken to ensure minimal delivery of conflicting information from governmental agencies, as this would result in confusion and loss of public confidence and trust.

7.7 Disaster Training, Drills and Exercises

With the increasing frequency of severe weather events in the Tennessee area, public education and training play important roles in public safety, and provide effective tools in sound preparedness efforts (AMS, 2000). The research by Paton (2003) stressed the importance of household disaster preparedness in building community resiliency. In addition, the findings of this study validated the view that maintaining public disaster training and education enhanced community resiliency. It was found in the course of the study an average of 49.9% of the public had interest in taking emergency preparedness classes at no cost to themselves. The study also found, with reference to the public focus groups, that emergency preparedness education had been received through employers, whilst other members of this group indicated they had completed American Red Cross first-aid training. Members of public focus group 2 reported no available source of disaster training.

Numerous opportunities exist for members of the public to obtain emergency preparedness training, free of charge, through such organizations as the FEMA online programmes (FEMA, 2012a) and free disaster preparedness courses for the public offered by the American Red Cross (ARC, 2012). Disaster training programmes are also offered by emergency management members to the community at no charge.

Fire is a type of disaster occasionally associated with severe weather events. A variety of responses were received from focus group participants regarding this topic. Some members of public focus group 2 indicated participation in fire drills at work, whilst members of public focus group 1 experienced regularly scheduled monthly fire drills within the housing development. Some members of public focus group 2, however, had not participated in any type of drill or exercise since grade school. During the three years of the public survey, it was indicated that only 7.3% of respondents had practiced disaster drills at home.

The broadcast media was shown to play a vital role in informing the general public of severe weather and other imminent threats capable of impacting an area. Research by Scanlon (2007) described the role broadcast media plays during a time of need in the community. Both the research of Scanlon (2007) and findings from this study reinforce the concept that, to be sufficiently well-versed to respond adequately, it is imperative that broadcast media have awareness of these potential threats, particularly in light of the increasing frequency of disaster weather events. To implement such awareness, development of community exercises to involve first responders and the broadcast media have taken place. Thus, providing the opportunity for all of the participants to understand each other’s roles and responsibilities during a severe weather event (AMS, 2000). At the time of this study, however, 59.1% of the radio stations and 57.1% of the television stations had not participated in this severe weather exercise, although some meteorology focus group participants indicated they had participated in exercises with the National Weather Service.

Many participants within the meteorology focus group reported having conducted severe weather preparedness programmes throughout the year for school-aged children and for civic organizations. Other members of the meteorology group reported presenting short segments of severe weather preparedness programmes during the weather section of the newscast. Additionally, the meteorologists were actively involved with the National Weather Service (NWS) Chat and with social media (Facebook and Twitter). The examples provided herein reveal the great extent to which broadcast media impacts the public through severe weather educational materials and community activities, all designed to engage the public in addressing severe weather related issues. Additional collaboration is ongoing through the SKYWARN programme developed by the National Weather Service (NWS). Various types of training and exercises are associated with this programme (NOAA, 2012b), which prepares and trains the public to become storm spotters.

A key finding, derived from responses obtained from the broadcast media focus group, was the nonexistence of disaster training and annual preparedness training requirements for air personalities and staff. Hence, the desire was expressed by members of the broadcast media focus group to have a better understanding of severe weather threats posed to the community, in order to improve severe weather and imminent threat communications to the public.

Members of the emergency management focus group reported providing severe weather information and training programmes to the public, on a county by county basis, throughout the year. The emergency management focus group also stated that severe weather training sessions were usually conducted one to two months prior to a severe weather season. Some of these training sessions were in partnership with the National Weather Service (NWS) and broadcast media. An example of this is the SKYWARN Spotter training recently conducted by the National Weather Service (NWS) in conjunction with emergency management agencies and the American Red Cross (NWSWFO, 2013). The American Red Cross also partnered with emergency management to conduct shelter training in Nashville on a quarterly basis.

Emergency management focus group participants stated that severe weather exercises programmes allowed emergency managers to review and to implement emergency response plans. This study confirmed that severe weather exercises could test accurately the capabilities and capacities of all involved in the response community. Testing of the emergency response plans provided assurance to emergency managers that the community possessed the knowledge and capacity to assimilate additional information and to improve performance when responding to the community during times of need.

A comprehensive exercise training programme was found to consist of drills, table tops, functional and full-scale exercises (FEMA, 2013a). An example of such an exercise was established by the U.S. Department of Homeland Security. The Homeland Security Exercise and Evaluation Programme standardized the methodology and terminology to be used when designing, developing and conducting federally sponsored exercises (FEMA 2013). Exercises were used to test policies and procedures of the emergency management agencies. Various findings emerged, relative to the scope of the survey. 53.6% of the emergency management agencies surveyed indicated no broadcast media involvement in the severe weather exercises. Most of the members of the emergency management focus group stated they had not participated in a severe weather exercise in the community, although some emergency managers indicated they had participated in live, severe weather events which qualified, in essence, as an exercise. This study validated the fact, however, that exercises were used in varying degrees to test the emergency management agencies' policies and plans. This supports the research conducted by Lindell and Perry, (2007a), explaining the importance of the continuity of operations planning and the potential impact on a community.

7.8 Community Protective Actions

An increase in the number of public respondents who maintained disaster supply kits in homes and cars was noted in this study during the three-year study period. Also noted in the public survey responses was a corresponding increase in numbers of flashlights, extra batteries, standard AM/FM radios, three-day supplies of available food, three-day supplies of water and three-day supplies of medicines. The study, additionally, showed an increase in the development and implementation of family communication plans, such as identification of meeting locations, practicing of drills at home and taking first-aid classes. The research by Sutton and Tierney (2006) discussed the critical path for community preparedness, specifying the inclusion of a state of household preparedness, private sector preparedness, community preparedness and organization preparedness. Information was provided by this study, supporting the concept that a critical step in disaster preparedness is knowledge of protective actions to be taken, as well as knowledge of disaster resources available to provide necessities for the community. An average of 45.7% of the public survey respondents indicated having updated family communication plans more than a year prior to the survey. Reasons expressed in the public survey for adequate preparedness included having experienced prior emergency situations, responsibility for children and/or the factoring of self-sufficiency. However, a lack of disaster preparedness was still shown to exist, the primary reason for which was insufficient thought given to the subject.

To test adequately the protective community action plans, response capabilities and capacities of the community, the study found public involvement in community disaster training and exercises to be of primary importance. Improvement in the ability of the community to respond to a threat with potential to impact the public was directly correlated to the level of community involvement. In further support, this study confirmed the importance that communities should not become complacent with reference to potential hazards that are capable of causing damage and harm.

7.9 Relationships and Partnerships

An integral part of protective action communications was indicated by members of the meteorology focus group to be the communication of first responders in providing information to broadcast media and to the National Weather Service. This important and immediate information allowed confirmation of situational awareness of severe weather events.

A key finding of this study was that less than 50% of broadcast media participating in the study had met with local authorities regarding emergency alerting and response plans within the prior year. Whilst members of the meteorology focus group indicated excellent working relationships with the National Weather Service (NWS), an important finding of these meetings was awareness of the need for improvement of the relationships with reference to severe weather events. Concerns were expressed by some participants within the broadcast media focus group that broadcast television and radio stations, located near state lines, experienced difficulty with coordination of multiple sets of local and state emergency response agencies. Members of the emergency management and meteorology focus group stated that working relationships of broadcast media with the first responder communities were shown to form a powerful communications network, with both the broadcast media and the first responder communities disseminating consistency and similarity of severe weather information to the public.

A desire was expressed by the broadcast media focus group participants for television stations to have optimal networking relationships with associated radio stations. This was felt to be essential by those in broadcast media to effectively convey news/weather to the general public, especially if television stations were unable to transmit due to an infrastructure support issue. The research of AMS

(2001) reviewed the need for effective communications between the broadcast media, the National Weather Service (NWS) and the public. This study corroborated that, with the age of digital technology, television stations maintained primary reliance on cable and/or satellite providers to bring the broadcast signal to the public, whilst most radio stations used recorded programming. Correspondingly, the research of Marc (2000) focused on the evolution of broadcast radio and broadcast television, demonstrating that, due to the developing digital technology, it is essential that television and radio stations maintain good working relationships in order to have capability to transmit news via radio broadcast when necessary.

The research of Subramaniam and Kerpedjiev (1998) examined the impact of the provision of advance weather information to local emergency preparedness agencies. This study validated the responses of emergency management survey members indicating the tandem nature by which emergency management agencies worked with the National Weather Service (NWS) and local television meteorologists in forecasting severe weather. It was found that 35.4% of emergency management agencies were actively involved with the broadcast media. Also, participants of the emergency management focus group confirmed good rapport among most emergency managers and television stations in their areas.

With reference to functional structure, the emergency operations centre (EOC) was found to be vital in enabling emergency management to provide and to sustain decision–making telecommunication capabilities to support the community in times of need (Lindell and Perry, 2007). In positive correlation, the emergency management survey indicated 84.9% of county emergency management agencies maintained an emergency operation centre (EOC), with a public information officer (PIO) of the emergency management agency providing information to broadcast media to maintain situational awareness of ongoing activities and events associated with disasters.

7.10 Public (Non-English Speaking Community)

Results of the broadcast media survey indicated that 87.7% of radio stations and 88.2% of television stations lacked the ability to provide information to the Hispanic/non-English speaking populations. Public focus group 3 respondents relied on children to translate information from television broadcasts spoken in English. This situation is substantial and critical in emphasising the importance of the capability to communicate using terminology understood and interpreted by children. Additionally, the research by Subervi (2010) reviewed the current penetration of broadcast media and emergency communications within the Hispanic community as a whole. This study showed that a lack of standards and regulations exist for the broadcast media with reference to communication requirements for non-English speaking members of the community during severe weather events.

Whilst some of the members of the emergency management focus group indicated ongoing development of disaster preparedness information in Spanish, most emergency managers had not produced preparedness information in any language other than English. Amongst those who had produced such disaster preparedness information within the diverse populations, community stakeholders were assisted by members of emergency management agencies in distributing disaster/severe weather information to the Hispanic community. Recognition of the needs of diverse ethnic and cultural communities was shown to be an integral factor in the building of relationships and social networking by participants of the emergency management focus group. This relationship enhancement has been beneficial in assisting leaders of non-English speaking communities to work with emergency management agencies and to provide technical assistance to the non-English speaking communities.

7.11 Perceived Risk

An increased expectation of the probability of a natural disaster occurring within the respondent communities over the upcoming two years was noted during the time of this study, rising from 10.8% in 2007 to 19% in 2010. Public expectation of a public health event increased from 4.1% in 2007 to 4.6% in 2010. Inversely, however, a decline in the perception of likelihood of a terror attack was indicated on the part of the public, from 2.1% in 2007 to 1.6% in 2010. Interestingly, in support of the increased inclination toward expectancy of a natural disaster, the National Oceanic and Atmospheric Administration recorded ten tornadoes in 2007, 56 in 2008 and 39 in 2010, within the state of Tennessee during the three-year period of this research project (NOAA, 2012c).

In preparation of imminent potential weather threats, participants of the meteorology focus group indicated the presence of protocols established for the interruption of pre-recorded broadcasts and live events. If management were not available at such times, it would be the duty of the meteorologist on staff to interrupt the broadcast. Members of the broadcast media focus group indicated a majority of radio stations maintained programmed emergency alert equipment and provided interruption of the air chain for tornado warnings, severe thunderstorm warnings and flash flood warnings. Participants of the broadcast media and meteorology focus groups, however, expressed concerns regarding cable provider interruption of television meteorologists' broadcasts with emergency alert system (EAS) warnings, as the EAS warning overrides the local broadcast meteorologist. Public reliance on broadcast television to provide up-to-date disaster information was confirmed by this research, nevertheless, even in light of enhancements in the community warning system (internet websites, SMART cellular phones and NOAA Weather Radios). In addition, this study confirmed, as well, the research by Abdulla (2002). This research focused on the credibility factor of newspapers, broadcast television and web-based news to the public, in showing usage by participants of all three public focus groups of multiple sources of information to validate severe weather threats to insure creditably of the emergency message. However, the proportion of public survey respondents who indicated they relied on radio stations, television/news and mail for emergency messaging decreased over the three year study period.

Development of new technologies issues were a topic of discussion by participants of the broadcast media focus group concerning the ability of television stations to move from the television studio, as well as the ability of the public to receive a signal from outdoor antenna. These capabilities were found to be somewhat limited by the advent of digital technology. This has occurred as a result of the reliance of digital technology by cable companies and/or satellite companies to relay the broadcast programming messages to the public. Television broadcast utilizing analogue technology enables broadcasters to transmit from the television station to transmitter sites, then directly to the public by way of outdoor antennas. However with broadcast television changing to digital technology, the signal from broadcast television must travel utilizing a carrier (cable company and/or satellite provider) to get to the public. Radio stations, whilst possessing the ability to transmit a signal from station tower sites, expressed limitations due to limited emergency generator back-up. Also, gaining access to the tower site was a potential hindrance to the radio stations. With these developmental changes in types of emerging technologies, this study indicated the importance of cohesive working relationships between radio and television stations to communicate news of severe weather threats to the public. Indeed, to minimize potential communication difficulties, broadcast media surveyed in this study indicated an established protocol to communicate to their studios when landline and cell phone communications were down.

In order to build trust and rapport with the community, it was found to be vital that all parties communicate similar, pertinent and accurate information to the public. To accomplish this objective, participants within the emergency management focus group stated having developed protocols with the National Weather Service (NWS) and with broadcast media to relay severe weather information to the general public. In addition, in efforts to reach all segments of the public sector, emergency management agencies utilised multiple layers of technology in developing messages to be conveyed to their community (PPW Report, 2002-02).

7.12 Seriousness/Comprehension of Threat and Subsequent Responses

Research by Riad et al., (1999) reviewed various reasons that persons chose not to evacuate from a dangerous situation and the significant influencing factors for these choices. In the course of this study, it was revealed that approximately one-fourth (23.1%) of public survey respondents indicated likelihood of evacuation with little question if instructed. 4.3%, however, expressly declined potential usage of a public shelter. Reasons given for lack of willingness to evacuate were concerned for the protection of home, concerned about the well-being of pets, worries of crime and danger and general reluctance to relocate to an alternative location. Some public respondents, however, indicated the necessity of having to locate to a safe shelter, as well as the need for transportation to travel to the shelter. Some members of public focus group 3 expressed concerns about U.S. Immigration and Customs Enforcement (ICE), whilst others in public focus group 1, particularly the wheelchair bound, expressed concerns about needing assistance to evacuate their particular facility. With 21.8% of the public respondents indicating having transportation but no shelter available, 1% having a place to stay but no transportation and 1% having no alternate location nor transportation, the objective within this focus group was minimization of these potential difficulties. Respondents from public focus group 1 held discussions pertaining to designation of safe places within buildings. Public focus group 1 members also expressed a need to plan for those who had no alternate place of shelter when evacuation was required and for those having no transportation to travel to the emergency shelters. This study confirmed that a successful evacuation involved cooperative and comprehensive communication within community groups and by local governmental agencies to explain necessary actions to be taken. This would ensure, as well, that members of the community understood all facets of the protective actions required in the face of various types of disaster events. Additionally, when planning for an evacuation, the necessity that shelters be open and operative is imperative, and that adequate consideration is given to the population with limited mobility.

An important finding of this research was the existence of a broad lack of comprehension regarding warning information. Concerns were expressed by members of all three public focus groups in correctly understanding the difference in terminology of tornado ‘watches’ and ‘warnings.’ Concerns were also expressed by public respondents regarding the methods by which television meteorologists utilised technology (i.e., dividing the television screen and having graphs, crawlers and radar shown on one screen) to communicate the severe weather threat to the community. Public focus group 3 participants also mentioned confusion and concern about graphics and colours used in the delivery of severe weather watches and warning messages. This study suggests that, as misunderstanding and lack of comprehension in these areas have been factors likely limiting cooperation by the public, the community would be well-served by additional address of these issues.

Information provided by respondents of this study indicated receipt of information via alternate sources. Results of the public survey showed 95.3% of radio stations and 85.7% of television stations utilised activation points, commonly referred to as 'triggers,' provided by the National Weather Service to alert the listening/viewing audience to severe weather, watches and warnings. Broadcast media and meteorology focus groups commonly displayed computer-generated alerts/warnings automatically rendered with crawlers (subtext) on the bottom of the television screen. This feature was provided by some television stations, whilst others cut in with interruptions during the severe weather watches and warnings. An increase was noted in usage of social media by the meteorology teams to communicate severe weather information to the community. Other means of communication by this group included the use of crawlers (subtext) on the bottom of the screen, radars with maps and the ability to provide live on-air communications. Members of the broadcast media focus group demonstrated a willingness to alert the public concerning severe weather warnings as frequently as necessary, noting as well the practice of relaying cancellation or expiration notices of severe weather watches and warnings when received from the National Weather Service (NWS).

Utilisation of many types of meteorology systems and networks, both public and private, by members of the meteorology focus group assisted in monitoring severe weather situations and in making accurate predictions related to the potential for the impact of hazardous conditions. An extensive weather monitoring and forecasting network was found in this study to cover the entire United States, and is in place and in use by the National Weather Service (NOAA, 2012a). In addition, a public – private partnership between the National Weather Service (NWS) and broadcast media exists, enabling comprehensive and timely dissemination of outlooks, watches and warnings to the public. This relationship allows up-to-date severe weather information to be conveyed by broadcast radio and broadcast television to the listening/viewing audience, with implementation of established protocols and interruption of pre-recorded broadcasts to alert the public of severe weather threat potential upon issuance of watches and warnings.

Research of Lindell et al., (2005) reviewed changes in forecasting, warnings and protective actions taken by the public over the past two decades. As there is no time for haphazard assessment of emerging situations or emergency response operations during severe weather situations, information gained by this study reinforced the importance of team member collaboration to convey concise, accurate information to the public as conditions warrant. The establishment of protocols in this regard, keeping pace with modernizations in technology, is the responsibility of the broadcast media during times of apparent need by the community.

Reliance upon the National Weather Service (NWS) to provide severe weather warning triggers was indicated by 86% of emergency management survey respondents. The emergency management survey showed that 87.1% of the severe weather watches and 84.9% of the severe weather warnings were communicated to the public as conditions warranted, using all available capabilities. Mention was made, however, by some participants of the emergency management focus group, of a lack of ability to notify the public of such weather threats. As previously mentioned, a large percentage (83.3%) of emergency managers were found to communicate routinely, in a timely manner, the cancellations or expirations of severe weather warnings upon notice from the National Weather Service. Correspondingly, this investigation confirmed the observations of Sorensen (2000), reviewing the need for equality in the ways warning information is issued across local communities. In addition, this study has shown that the emergency management community has worked in close conjunction with the National Weather Service (NWS) to enhance capability in addressing issues related to severe weather.

As severe weather usually affects more than one county at the time, it is essential that memoranda of understandings are in place in order that county emergency managers may share information about on-going events in their county with neighbouring counties. Emergency management focus group participants stated having memoranda of understanding in place for the sharing of such information. The research of Bharosa et al., (2010) studied ways in which such information is shared and coordinated during disaster situations. This investigation verified that agreements of this nature reduce redundancy and increase effectiveness of all emergency management agencies in the affected areas. The manner, however, in which these messages were communicated to the public depended upon the capabilities of the particular county. Emergency management focus group participants demonstrated enhancements in alert/warning systems, whilst the more rural counties tended to rely on Emergency Alert System (EAS), Emergency Managers Weather Information Network (EMWIN) or NOAA Weather Radio to communicate warnings to the public. It should be noted that the Public Safety Answering Point (PSAP) (E-911) was found to have the ability to conduct reverse 911 public notifications via landline phones only. In summation, the broad scope of information gained by this study confirms the critical value of having cohesive plans in place to share vital information.

7.13 Infrastructure Issues

Numerous natural and man-made disasters in the United States and Canada impacted the power grid in the United States during the period1990 to 2004 (Simomoff et al., 2007). As a result of such disasters, 46.2% of the respondents to the public survey indicated they had lost electricity for at least three days. The importance of having household contingency plans in place, particularly for power outages, is confirmed by research obtained in this study. Participants from public focus group 2 had generators and capabilities in place to address power outages. Also, it was found by this study that, in order to mitigate the difficulties associated with these types of situations in a proactive manner, the need is evident to build more resiliencies in the power grid within the United States. As indicated by the emergency management and broadcast media focus groups, the impact of power outages on the ability of emergency management and broadcast media to convey alerts/warnings to the general public is significant. Thus, timely response to the emergency situation is directly affected. A key finding with issues related to power outages included the impact on basic necessities the public relies on such as communications, lighting, cooking, refrigeration, heating, air conditioning in the home as well as the impact to community grocery stores for food supply. Such disaster events bring about the need to have additional provisions in place (i.e., bottled water, non-perishable foods, batteries and flashlights), as revealed by the research of Lodree, (2005). Transportation and alternate residential requirements were noted to be potential necessities by the population. With reference to the public survey respondents, 28.2% indicated having had to evacuate the home for at least one night and 14.9% were unable to travel to a grocery store for an average period of three days due to the impact of a disaster.

With regard to the functionality of broadcast media, severe weather presents great potential to impair the abilities of local television, broadcast studios and radio towers to relay severe weather information to the public. In addressing this issue, broadcast media focus group participants indicated a readiness of resources in the event of network and power failure. Temporary locations of operations were indicated to be in place, to enable broadcast media to have both the technical personnel and resources necessary to restore transmission to the public.

Correspondingly, to further expedite the dissemination of information, broadcast media focus group members stated that, optimally, credentials should be issued for personnel on assignment. The credentialed individuals would be required to be of a recognized news service or organization and would have ready access to impacted areas. It is noted in the research by Henke (2008) that emergency credentials are expressly recommended for critical personnel responding to these types of events. This study indicated that such credentials should include a photograph of the person, first and last name and the name of the affiliated organization. A noteworthy finding of this investigation was the presence of a keen interest of the broadcast media focus group in developing a standardized credentialing system, with issuance by civil authorities, to assist in disaster circumstances.

Responses of emergency management focus group participants indicated the existence of protocols in place to alert the public about severe weather watches and warnings if an electrical grid shutdown were to occur. The emergency management survey indicated that, during a power outage, 73.3% of county emergency managers relied on local response agencies to assist in notification of the public via public address systems (PA) within their vehicles. 72.1% of these emergency managers utilised broadcast radio stations to convey information. With reference to the research by Nelson (2008), concerning the availability of viable forms of communications in notifying the general public during a mass casualty event, the results of this study found that emergency management agencies requested assistance from first responder agencies within the community to assist in neighbourhood by neighbourhood communication.

7.14 Communication Strategies

Awareness of the particular public sectors with and without capability to receive notifications by certain alerting/warning technology was of critical importance in the communication strategies presented, with special consideration given to isolated, rural areas regarding such limitations (NOAA, 2012a). The most effective manner noted to receive emergency messages was via television news, expressed by 48.6% of the public survey respondents, whilst 12.3% preferred mass telephone calls and 12% radio station notification. Evaluations of public survey responses indicated a trend toward increasing receipt of alerts/warnings utilising electronic media (email or the internet) during the three-year period and a corresponding decrease in reliance upon broadcast television (from 51.9% in 2007 to 37.6% in 2010) and broadcast radio (from 14.8% in 2007 to 8.8% in 2010).

With the advent of the internet and related capabilities to obtain up-to-date severe weather information, numerous sources (i.e., SMART cellular phone, internet applications and electronic mail) have become available to the public for advisement of severe weather information and appropriate protective actions to be taken (TWW, 2012). With cellular technology radically changing the ways in which communication takes place on a daily basis, the development of such technology as the SMART cellular phone allows time-sensitive applications and information to be conveyed swiftly to the end user. However, concern was expressed by all members of public focus groups that, as cellular telephones must have electrical power to operate and, with cellular phones replacing landline sets, cellular communication potentially could become unavailable due to no electricity within the community. Research by Townsend and Moss, (2005) reviewed the impact of the presence and functioning of telecommunication infrastructures on prevention of loss of life and property damage by reduction of delays and errors in disaster response. Confirmation was provided by this investigation that the functionality of such infrastructures significantly impacts the ability of the public to receive timely information. Concurrently, results of this study reinforced awareness of the need to have multiple identified sources by which to receive severe weather information.

Concerns regarding communications, particularly those involving the digital nature of modern television, were expressed by members of the broadcast media focus group. The positive and negative factors of various aspects of digital television were examined in the research of Rennie, (2001) which confirmed the bourgeoning reliance of digital television stations upon cable providers to convey messages to the public. As television and radio communications remain the preferred forms of information, following several decades of public reliance on such, maintenance of these avenues of communication is vital. In support, the AMS, (2000) reported that informed awareness of threats and risks associated with severe weather events by the receipt of valid, timely information was enhanced through the collaboration of the National Weather Service (NWS) and the broadcast media. Confirmation was provided by this study that persons residing in areas impacted by severe weather emergencies on an annual basis possessed increased levels of awareness through access to available sources of viable information.

Research by Balluz et al., (2000) studied public reaction to siren-generated tornado warnings, which, as noted by members of the broadcast media focus group, were never intended to be a means of indoor notification to the public. Balluz et at., (2000) study confirmed that the outdoor siren systems existing in the United States were designed to notify the public, outdoors and to merely encourage the public to seek shelter in a safe area of refuge upon hearing the sirens.

Both broadcast radio and broadcast television stations were relied upon by the general public to supply up-to-date severe weather information and potential of impact on the area. The broadcast media survey showed that 80% of the broadcast radio stations relied on NOAA Weather Radio for severe weather warnings. Broadcast media survey respondents also indicated that 73.3% of radio stations utilised the Emergency Alert System (EAS) to transmit local emergency alerts to the public. During pre-recorded broadcasts, 71.1% of the radio stations indicated having the capability to interrupt programming to alert the public of a severe weather warning to the community. Weather portions of the newscast provided information to the general public via weather centre, subtext (crawlers) and news/weather reports. A reliance on NOAA Weather Radio to convey warnings was indicated by only 47.6% of television stations. With the advent of the internet and various wireless communication devices, dependence on the current Emergency Alert System (EAS) by broadcast television appears to be dated, given that the small, grey screen containing text messaging remains the manner of alert display (Moore, 2006).

Research by Butterworth et al., (2010) studied the impact of the internet, various technological advancements and social media communication applications on the ability of broadcast media to communicate severe weather threats to the general public. A segment of this investigation also focused on this area. Data results indicated that 85.7% of the television stations placed subtext on the bottom of the television screen to convey alert messages. Correspondingly, in utilisation of the development of computer software and coding of all National Weather Service (NWS) warnings and watches, research of Golden and Adams, (2000) reflected automatic display of subtext by some broadcast television stations. Additionally, meteorology focus group participants stated that television stations collaborated with private contractors to provide weather graphics, satellite feeds and closed-captioning (text for the hard-of-hearing). Options were provided by some television stations for members of the public to sign up to receive severe weather alerts/warnings. Reliance by meteorologists on National Weather Service (NWS) Chat, storm spotters and NOAA Weather Radio for up-to-date weather reports was revealed, with extended reliance placed on cellular phone applications when out of studio.

Decisions regarding the conveyance and frequency of alert messages were a field of investigation in this study, in correlation with a review of research by Hoium et al., (1997) examining the decision-making process governing the determination to warn or not to warn. Survey results of this investigation found the decision to broadcast to the public during severe weather often was left solely to the discretion of station meteorologists on duty, although some members of the meteorology focus group indicated routine practice of ‘going live’ on air for tornado warnings. The meteorology focus group participants stated that, due to the unpredictability of severe weather events, the timeliness of conveying information to the public could be critical, with a potential window existing of several hours to react to a tornado watch, but only minutes for protective action in a tornado warning. The meteorology focus group participants also indicated that the manner in which information could be disseminated to the public was affected by the type of programming on air at the time of the alert. Participants of the meteorology focus group stated that live events, awards shows, sporting events and other events unable to be recreated could not be interrupted. A key finding is that the public is relying on multiple sources of information for severe weather such as broadcast television, internet and cellular phone applications.

Concerns were expressed by participants of this group regarding interruptions of the meteorologists' reports with Emergency Alert System (EAS) messages by the local cable provider, Comcast. Members indicated insufficient technological capacity on the part of the Comcast cable provider to opt-out of certain television stations, thereby causing issues with television meteorologists being removed from the air during a severe weather event when the EAS (grey screen announcement) was activated by Comcast Cable. Members of the meteorology focus group stated that this issue can be resolved with modernized equipment.

United States federal law requires that television stations have closed-captioning for the broadcast of emergency information to the hearing-impaired audience. However, although it is a federal requirement, research by Phillips and Morrow (2007) revealed that some broadcast television stations do not provide live captioning during severe weather events. This investigation confirmed the requirement of the federal government that broadcast television stations use closed captioning for emergency messages, but results of the broadcast media survey indicated that only 52.4% of broadcast television stations were shown to use this type of captioning. Members of the meteorology group, however, stated that members of the broadcast media abided by regulatory obligations to provide closed-captioning when broadcasting emergency information and to do otherwise would result in fines imposed upon the broadcast media. Some assurance, therefore, is provided that the hard-of-hearing community receives accurate, timely severe weather information via closed-captioning during live break-ins from broadcast television stations.

To improve quality of information conveyed, members of the meteorology focus group indicated utilisation of enhanced radar technology provided by the National Weather Service (NWS) and the Storm Prediction Centre. As stated by participants of the meteorology focus group, agreement as to what constituted ‘important and noteworthy’ information differed in the eyes of the broadcast media and the public. However, members of the meteorology focus group indicated that the enhanced technology augmented the quality of severe weather information delivered to the public. Also, the broadcast media focus group indicated the emergence of new technology (Integrated Public Warning System [IPAWS]/Commercial Mobile Alerting System [CMAS]/Wireless Emergency Alerts [WEA}) to assist county emergency managers in the ability to alert/warn using the alerting polygon to mobile devices (FEMA, 2012c).

Members of the emergency management focus group indicated they receive severe weather information from the National Weather Service (NWS), broadcast television and internet websites. This information is then relayed to the public to take the necessary actions to protect themselves from upcoming severe weather events.

The research of Burkhart, (1991) reviewed the role of broadcast media in disseminating critical information related to severe weather risks and to disaster preparedness efforts. Results of this investigation revealed that county emergency managers work with broadcast media and the National Weather Service to protect the public from severe weather that may impact the community. As indicated by all three focus groups (emergency management, broadcast media and the National Weather Service (NWS)), they participate on weekly conference calls during severe weather months as well as jointly sponsor weather related training and activities.

Such collaboration is reflected in strategies adopted by the State of Tennessee to disseminate severe weather information. These strategies consist of conference calls of county emergency management agencies, the National Weather Service (NWS) and the Tennessee Emergency Management Agency (TEMA). Additionally, TEMA relies upon the Emergency Management Network (EMnet) to obtain and convey severe weather information to county emergency managers.

7.15 Receiving Information in a Timely Manner

The research by Mileti and Sorensen, (1990) assessed communication capabilities and effectiveness of existing warning systems. Thus, a proposal was suggested in the PPW Report, (2002-02) that a national all-hazard public warning system be developed to include a comprehensive severe weather warning system with multiple types of technologies (i.e., community sirens, mass telephone notifications, SMS and emails) to relay severe weather and imminent threat information to the public. Correspondingly, it was a finding of this study that redundancy increased the effectiveness of the community alerts/warnings.

A key finding revealed in the course of this study involved the existence of challenges in facilitating delivery of easily understood and interpreted information to all segments of the population. Participants preferably would like information provided to them in their native language. The research by Phillips and Morrow, (2007) focused on the influence of cultural backgrounds regarding ways in which warning messages are received and the appropriate protective actions taken. This study validated the assumption that knowledge from whence disparate segments of the population receive information is beneficial, in that each segment of the community more likely receives accurate, comprehensive severe weather information and advisement of appropriate precautionary actions to be taken.

Participants of public focus groups 2 and 3, as well as the meteorology and emergency management focus groups, discussed the influence of developing technology such as the internet and SMART cellular phones on the enhancement of severe weather communications. These modernizations in communication are felt to be vast improvements in relaying critical messaging. It is essential, however, that in order for the improvements to be effective, the sender (agency sending the message) must understand the capabilities of the receiver (receiver of the message) to obtain the severe weather alerts/warnings being conveyed. And, as noted prior, each segment of the population possesses preference as to favourite and/or most effective ways to receive the severe weather information (FEMA, 2012).

The views of Golden and Adams, (2000) reflect that timely, accurate and pertinent communication, along with increased public understanding, assists in preserving life and property. In correlation, meteorology focus group participants indicated that severe weather information was provided in a timely, accurate manner for their viewing/listening audience. Members of this focus group stated that, within the middle Tennessee area, television meteorologists collaborated in an excellent working relationship with each of the television stations in the Nashville market and with the National Weather Service (NWS). Results of the broadcast media survey found that 84.2% of broadcast television stations were satisfied with the forecast information provided by the National Weather Service (NWS), 84.2% of broadcast television stations were satisfied with the timeliness of severe weather information and 84.2% of broadcast television stations were satisfied with the accuracy of severe weather information. The views expressed, however, were limited to the meteorology focus group and did not include the point of view of the public.

Additionally, this investigation confirmed the observations of Sorensen, (1987), validating the assumption that reliable, concise and readily understood information is provided by broadcast media to the public. In support, television meteorologists were found to utilise an array of tools (i.e., Weather Service International, Weather Central, Associated Press and the National Weather Service (NWS) Chat) to disseminate severe weather information to the public, whilst broadcast media and the National Weather Service (NWS) worked in conjunction to convey accurate, consistent messages to the public in a timely manner. Information gathered from all three public focus groups indicated that the broadcast media needs to take into consideration the public's input regarding how information about severe weather is relayed to them. Members of all of the public focus groups state that the public is choosing their channels because of what and how the broadcast media presents severe weather information that is easy to understand and interpret.

Placing an emphasis on accuracy, members of the meteorology focus group indicated that, although use of the NOAA Weather Radio was beneficial, better results might be achieved by utilising the National Weather Service (NWS) polygon rather than activating an entire county. The resultant benefit of the use of the polygon warnings, according to a meteorologist within the meteorology focus group, would be a narrowing of false alarm rates. These false alarm rates are detrimental, in particular, because they reduce the public's willingness to respond to future events. However, achievement of a reduction in number of false alarms related to severe weather was indicated by the National Weather Service (NWS) with the use of enhanced radar systems (NWS, 2012b). In additional efforts to improve accuracy, participants of the meteorology focus group indicated discontinuance of specification of area storm impact times by the National Weather Service (NWS) due to high levels of inaccuracy.

Results obtained from the emergency management survey indicated a high level of satisfaction by county emergency managers with the information provided to them by the National Weather Service (NWS). Details of this study reflected 100% satisfaction of emergency managers with forecast information, 100% satisfaction with timeliness of severe weather information provided and 95.3% satisfaction with accuracy of severe weather information provided by the National Weather Service (NWS). County emergency managers, as noted by 62.4% of the respondents, indicated increasing accuracy in information received from the National Weather Service (NWS) during the previous five years. The importance of county emergency management agencies having access to National Weather Service (NWS) data was felt to be significant. Two particular bodies of research confirmed the usefulness of information provided to assist with planning and response phases of a disaster event. The research by Subramaniam and Kerpedjiev, (1998) focused on the receipt of accurate, appropriate severe weather information by local preparedness agencies and the subsequent enhancement of ability to notify the public of appropriate protective actions to be taken. Additionally, crisis communication during the 1997 Red River Valley flood in North Dakota and Minnesota was a focal point of study by Sellnow et al., (2000), and further confirmed the value of the information conveyed. Even though these studies were carried out more than 15 years ago, very little research has been done in this area since then.

Timeliness in disseminating severe weather information with potential to impact the community remained a major consideration for the county emergency management agencies. The PPW Report, (2002-02) demonstrated the nature of rapidly changing weather patterns. Thus, monitoring severe weather conditions and providing timely severe weather alerts/warnings was noted to be critical.

The view was expressed by some emergency management focus group participants that a portion of rural county emergency managers felt information provided by the National Weather Service (NWS) to be less accurate than desirable, due to the fact that the counties were located on the fringe of the National Weather Service (NWS) region. A consensus emerged among participants within the emergency management focus group of the need for expansion in technological improvements in the system utilised by the National Weather Service (NWS). Such improvements would prevent delays in the receipt of severe weather information by emergency management agencies, and thereby lessen subsequent delays in communicating timely information to the public.

7.16 Comprehension and Interpretation of Information

To better educate the public in understanding and correctly interpreting the threat potential of severe weather, as well as the protective measures to be taken, the broadcast media, National Weather Service (NWS) and emergency management agencies all reported conducting educational programmes for this sector of the population. Whilst several of the participants of public focus groups 1 and 2 indicated that severe weather information received was easily understood and interpreted, numerous alerts, bugs and subtext (crawlers) caused some members of public focus group 2 to feel that meteorologists have ‘gone overboard’ in attempting to explain and broadcast significant weather events to the public. Correspondingly, some participants in all the public focus groups expressed concerns that a level of disregard had developed due to the number and frequency of alerts, causing members of the broadcast media group to question the amount of attention actually given to the information contained in the severe weather broadcast. Although the PPW Report, (2002-02) stated that mass panic is greatly reduced when accurate information is disseminated to the entire community, this study suggests the information should be appropriately conveyed in line with the severity and timeliness of forthcoming severe weather conditions.

The research by Moore, (2006) reviewed the potential of improvement in emergency notification through usage of telecommunications and the internet. In correlation, findings of this study demonstrated that, in order to optimize the efficiency of relaying severe weather information to the public, multiple formats, styles and means were utilised by broadcast media to disseminate severe weather and imminent threats to the viewing/listening audience. Accessibility by the public to multiple sources of alerts/warnings further aided in efficient and effective relay of information through such media as television, radio, telephone and internet.

As noted previously, the opinion expressed by a member of the meteorology focus group that information obtained from the National Weather Service (NWS) was easily understood and interpreted was countered by some participants within this same group. In particular, the effectiveness of subtext (crawlers) was questioned due to the limited information contained able to be conveyed. The possibility of generating confusion among the public as a result was noted, with the suggestion that this area merits the consideration of better public education and research into effective usage. A specific example was provided by the research of Hales, (1990) which reviewed information conveyed by watch/warning programmes during the occurrence of actual tornado activity. Broader education of the public in understanding the difference in terminology between ‘watch’ and ‘warning’ was recommended, thereby better ensuring appropriate protective actions are taken.

Correspondingly, participants in the meteorology focus group indicated that such descriptive words as ‘slight’, ‘strong’ and ‘great risk’ in the presentation of severe weather events impacted public perception and/or interpretation of the weather conditions. Members of the meteorology focus group stated that meteorologists should be as specific as possible regarding the nature of the threat, communicating in first-person and keeping the message simple and succinct.

To better address the non-English speaking populations regarding severe weather and imminent threats within the United States, this study found the need to establish a non-English emergency communications capability to operate in conjunction with the English-speaking system. Research by Benavides and Arlikatti, (2010), reviewing the preparedness of broadcast media in communicating warnings to non-English speaking communities, correlated with findings of this study and emphasized the need to have a system in place to provide emergency preparedness information to non-English speaking communities. This would assist in providing clearer understanding of the appropriate protective actions to be taken by members of these segments of the community.

Members of the emergency management focus group concurred with the need for improvement in the current alert/warning system in which the entire county is activated during an emergency. Preferably, this system would match the polygon in use by the National Weather Service (NWS). However, views were expressed by some emergency managers that NOAA Weather Radio is satisfactory in alerting the public. The NOAA Weather Radio is part of a community warning system for dissemination of National Weather Service (NWS) warnings (Mogil and Grope, 1997). In further efforts to update and augment reception and comprehension at all levels within the community, meteorology focus group members stated that the National Weather Service (NWS) has worked well with NOAA Weather Radio manufacturers in helping to adapt NOAA Weather Radios with strobe lights and bed vibrators for hearing-impaired persons.

7.17 Validation of Initial Information

With the plethora of technological devices available to the public to facilitate receipt of alerts/warnings, it was found essential that a validation process be in place to help ensure public receipt and understanding of the information being communicated (Quarantelli, 1982). Members of all the public focus groups indicated frequent monitoring, particularly of broadcast television, to validate severe weather information. Comprehension of the capabilities and limitations of these technologies was shown to be beneficial in the validation process.

As part of the validation of information process, the desire was shown to exist by the part of the public for quality information about severe weather having potential to impact the community. Dependence was indicated by 28% of the public respondents on televised community hotlines through which additional information could be gained in validation of severe weather and imminent threats posed to the community.

Members of all the public focus groups indicated an attribute of particular importance was the delivery of effective messages, without overly exaggerating the scope of the threat. Public focus group 3 participants expressed concerns regarding terms, graphics and displays of multiple colours utilised by television meteorologists, and the resultant confusion experienced as a result of inadequately understanding the meteorological displays. The research by Aguirre, (2008) indicated that weather information is sometimes understood but frequently misinterpreted, thus demonstrating the need for standardization of terms, graphics and colours when describing severe weather on broadcast television.

Findings of this study indicated that respondents from the public survey and all the public focus groups were more prone to take protective action when information was received from multiple sources and the messages were consistent in information conveyed. The need for consistency of information was found to be relevant relative to the various demographics within the community (Aguirre, 2008). This issue was addressed in this investigation by research involving three disparate groups of the public: the public at large, the under-served and the non-English speaking. Each group obtained information about disaster alerts/warnings via differing methods. For example, in the absence of a television to view facial expressions and body language, key words were critical when crafting a message that was effective and understood by the target audience. It is suggested by this study that alternate, additional methods of providing information clearly would be beneficial in these types of environments.

Some members of the television meteorology group indicated that vendors were the primary source of severe weather alerts, with “Weather Central” and EAS utilised as back-up. Others expressed reliance on NOAA Weather Radio as a secondary source of information. All television meteorologists indicated usage of NWS Chat and social media to communicate to their followers. These examples of real time interaction support the research of Butterworth et al., (2010) indicating the tremendous impact the internet and other wireless devices have on the ability of broadcast media to deliver live footage on air quickly. This study further demonstrates the utilisation by meteorologists of a large array of tools available to them to disseminate severe weather threats to the general public.

As stated, members of the emergency management focus group reiterated the particular importance of public education in understanding the difference in meanings of the terms ‘watch’ and ‘warning’. In conjunction, this study showed that public education programmes could enhance public knowledge of the protective actions which should be taken in a severe weather event. Research by Lindell and Perry, (1992a) reviewed the need to train the community with regard to protective actions in the event of a disaster impacting their community. Whilst members of the emergency management focus group expressed the need for such on-going public disaster education programmes, findings of this investigation, however, also revealed the need of the public to assume a level of responsibility for personal safety.

7.18 Capabilities for the Hispanic/Non-English Speaking Community

In developing a comprehensive warning system, it is essential that the agency initiating the message (sender) consider the multicultural social context of the area. Relative to this topic, concern was expressed in the research by Benavides and Arlikatti, (2010) of the ability of broadcast media to convey disaster information and severe weather information to the non-English speaking community. In addition, the findings of this study verified that understanding the make-up and complexity of varied ethnic groups within the communities, along with means by which to alert/warn these sectors, should be part of the planning process. Although alerts are predominantly conveyed in English, focus group 3 participants felt it nevertheless important that the non-English speaking community receive the alerts due to the warning nature of the alerts.

Limited capability in transmitting in a language other than English was a hindrance expressed by members of the broadcast media focus group and, although some stations indicated maintenance of relationships with Spanish radio stations, there was limited awareness of current status of the agreements in place. Broadcast media focus group participants indicated presence of bilingual personnel at some stations, although those individuals were not necessarily on-air talent available to assist if needed. In an ongoing effort to bridge the language barrier, however, a member of the meteorology focus group stated that a manufacturer of NOAA Weather Radios has developed technology capable of transmitting the initial alert/warning in English, Spanish and French. That member also reported the existence of three National Weather Service (NWS) offices which transmit warnings in Spanish (El Paso, Texas, Hialeah, Florida and Coachella, California).

Members of focus group 3 indicated that Spanish television cable channels did not provide coverage of local severe weather, with most providing merely films and entertainment in Spanish. Members of the meteorology focus group indicated, however, the conveyance of severe weather alert/warnings using the Emergency Alert System (EAS), issued by cable providers and communicated in English. Researching an area with a large percentage of Hispanic population, the study by Subervi, (2010) reviewed the policies and practices related to emergency communications to the non-English speaking communities in central Texas. This study showed that the non-English speaking communities commonly relied upon English-speaking broadcast stations to relay severe weather information. Broadcasts are issued by the Emergency Alert System (EAS) in English via both television and radio stations in most cities throughout the United States. This information validates the findings of this study, reflecting the view that our current comprehensive warning systems have potential capability to alert/warn all multicultural sectors of the public of impending severe weather.

The research by Parsons and Fulmer, (2007) reviewed expansive disaster events in which few or no advance warnings were provided to large populations, access to emergency shelters and medical treatment was severely limited and illness and death resulted. Correspondingly, as communication is of the essence, this investigation verified that proactive identification of communication and resource requirements of diverse populations by emergency management agencies is vital. Importantly, some members of the emergency management focus group indicated having working relationships with outside organizations and agencies to assist in communicating to the non-English communities. It was reported that one county emergency management agency subscribed to a language service to assist with communication efforts. With regard to the hearing-impaired population, a member of the emergency management focus group indicated that a NOAA Weather Radio with strobe light, bed vibrator or other alerting device enabled capability of alert to this segment of the community.

Participants of the emergency management focus group indicated interaction with a variety of groups in the community to assist with bilingual communication. A member of the emergency management focus group reported producing flyers and brochures in Spanish for the Hispanic community. As noted previously, the 2002-02 PPW Report reviewed the need for an all-hazard public warning system to alert/warn all segments of the public, indicating the United States to be a “melting pot” with many non-English speaking citizens and concluding that reaching across the language barrier is essential.

7.19 Relationship of Knowledge/Experience to Levels of Preparedness

The survey of public respondents indicated a significant difference in the levels of preparedness among individuals who had experienced a prior disaster from those who had not. Public respondents with prior exposure were more likely to have a disaster preparedness kit at home and in the car, as well as having taken additional first-aid classes since the previous disaster experience. The research by Mileti et al., (1975a) reviewed existing literature to determine what is known about the human response to disasters. This study validated that an individual's first-hand knowledge of potential threat and possible harm associated with a severe weather event better prepared the individual to address the aftermath of such an event.

In further conformity to the requirements to identify and provide resources for diverse needs, members of the emergency management focus group reported investment in community sirens to help alert the general public at large of severe weather events. The research by Lindell and Perry, (1992a) reviewed the importance of preparedness training and exercises to improve the notification process. Although the public survey respondents indicated no significant correlation of levels of preparedness to the presence of community warning sirens, this study showed the existence of the need to educate the general public regarding protective actions to be taken upon activation of community warning sirens.

7.20 Limitations

Data included in this study was derived from public emergency management, broadcast media and meteorology sectors of the population for assessment and review purposes of this research. The inclusion of the referenced groups, solely, however, lends to limitations with regard to the qualitative nature of the data.

The quantitative portion of the study included data originating from broadcast media and emergency management, collected during the course of a one-year period, using a web-based survey tool. In addition to the time limitation, a geographical limitation presented itself to the extent that the quantitative study sampled only the Nashville Metropolitan Statistical Area (MSA) during the years 2007, 2008 and 2010, also using a web-based survey for the public survey. It should be noted that use of a web-based survey tool causes difficulty in determining the baseline.

The quantitative population sample data was derived from participants possessing higher relative levels of education, who were Caucasian, English speaking, with income levels typically regarded as adequate. Included, as well, were those at the opposing end of the ‘social spectrum’, i.e., low-income, poorly educated and/or non-English speaking members of the study area. The population found to be at greatest need for disaster management assistance, those at the lower end of the spectrum, were found to have access to the internet for purposes of this study, but elected not to participate.

The voluntary nature of the responses included in the statistical sampling leads to a potential margin of bias and must be recognized. To illustrate, certain respondents were more likely to hear about the survey than others, some possessed strong sentiment regarding the topic and were more likely to respond. However, the breadth of information obtained from the participants demonstrated a suitably representative sample and provided meaningful results.

7.21 Conclusions

The study reviewed diverse segments of the public to address the benefit of engaging the entire community including broadcast media and emergency management, provided a more comprehensive picture to inform how to pragmatically address stakeholders concerns towards the warning and preparation for severe weather events.

It was found within this study that members of the public with prior knowledge and experience of severe weather events were better prepared for future disasters. Consequently they had an understanding of the threats associated with severe weather that enabled them to take the appropriate protective actions.

The study also showed there are opportunities to educate the general public, as well as the broadcast media and emergency management sectors of the population, regarding disaster awareness and preparedness which proved to be an important topic that is needed to be addressed. This was increasingly evident especially due to the transition of the notification of the public by the broadcast media through various types of electronic equipment. Other issues for the broadcast media and emergency managers to address were the development of efficient and effective ways of providing severe weather information to the diverse population including the many languages and diverse socioeconomic cultures. Public education in a variety of forums was suggested as a viable avenue to assist in accomplishing the provision of information and engagement of the public.

The perceived risk varied amongst the respondents with some discounting the danger whilst others put the welfare of their pets and their belongings above personal safety. It was identified that there was a need to address the dissemination of information to all sectors of the community taking into account the needs of all minority groups. There is a need for severe weather information to be disseminated to all sectors of the community, thereby providing exposure for further research and development in this area. Consequently, there is a role for broadcast media and emergency management to understand the requirements to put out a clear and concise message that is understood by the diverse population throughout the United States. This will enable the public to have a better understanding of the extent of the impending threat to their safety, the area of impact, potential timing of the event and the appropriate action to be taken.

The public voiced their opinion on the benefits of the multi-layered warning systems to inform the public of emergent situations but also the disadvantages of the current communication/notification strategies in use within their community and statewide demonstrating the need to develop and update current systems. A cohesive working relationship between broadcast television and broadcast radio stations, established prior to a severe weather occurrence, factored favourably in allowing news and weather to be broadcast to the public via radio at times when infrastructure issues impacted the capability of broadcast by television. Various disparate, non-conforming points of interest emerged in the course of this study which merit further attention. For example, interesting dichotomies were shown to exist with the advent of modernized technology: the ability to convey and to receive severe weather warnings is now hindered as well as enhanced; utilisation by younger segments of the population of SMART cellular phone applications, together with computer/internet proficiency, whilst analogue cellular phone devices remain in primary use by seniors, many of whom do not have computers; and the reliance of the non-English speaking population on radar imagery and colours for information, whilst the hearing-impaired community relies on captioning which is unable to be provided during live, severe weather broadcasts.

Significant potential for improvement and avenues of implementation exist with regard to these pertinent issues.

7.22 Recommendations

There is a need for:

1. Broader community outreach, education and training related to severe weather events, including appropriate preparation and protective actions to be taken (i.e., identification/designation of emergency shelters for the community). Particular attention should be given to the low-

income/government housing, non-English speaking populations and other minority groups.

2. Translation of disaster preparedness information to the Spanish language to ascertain disaster management assistance required by the economically and educationally deprived Hispanic population.

3. Planning transportation means for those who are financially unsound or are unable to evacuate due to disability.

4. Participation of broadcast media with county emergency management agencies in local emergency planning, including coordination of alerting capabilities.

5. The development of severe weather exercise programmes to involve the general public (public at large, low-income/government housing and non-English speaking), the broadcast media and emergency management agencies, in order that existing plans and capabilities can be tested adequately.

6. Standardization of credentials of broadcast media and emergency management personnel.

7. Emergency back-up generators as standard radio station equipment.

8. Clear universal modern graphics when conveying severe weather with the use of standardized colours (green, yellow and red).

9. Standardization of initial severe weather message content utilized by broadcast meteorologists.

10. Enhancement of the existing power grid throughout the United States to ensure greater resiliency.

11. Improvement of the NOAA Weather Radio to transition from a county-wide alert to polygon alert capability with a global positioning system (GPS) chip located within the radio device.

12. Increase in capabilities of broadcast media and emergency management agencies to alert and communicate with the non-English speaking segments of the community.

13. Provision of closed-captioning for the deaf and hard-of-hearing during live severe weather broadcasts.

14. Recommendation for future research:

    a. Explore the impact of providing emergency preparedness information materials in native languages.

    b. Investigate the use of standardized graphics and colours to convey the severity of encroaching severe weather.

    c. Evaluate improving the existing NOAA Weather Radio to include polygon warnings, a global position system (gps) chip for automatic frequency selection and contain a rechargeable battery.

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Appendices

Appendix A: Glossary

Definition of Terms

Definitions of key terms used in this body of research follow.

1. ***Alert Triggers*****:** Automatic activations of emergency warning messaging specifically tailored to an area, relevant to type of pending threat/event.

2. ***Closed-Captioning***: Process of displaying subtext on a television, video screen, or other visual display to provide additional or interpretive information. Closed-captions typically display a transcription of the audio portion of a programme as it occurs, either verbatim or in edited form, frequently including non-speech elements.

3. ***Crawl, Crawlers*****:** Running messages or subtext displayed on lower portion of television screen advising of pending threat to the area.

4. ***Emergency Scanner***: Electronic device with capability to monitor radio frequencies and communications.

5. ***Live Cut-Ins***: Interruptions of network programming with live announcements related to a pending threat and/or event impacting the viewing/listening audience.

6. ***National Weather Service Polygon*****:** Visual warning of a polygonal shape specifying locations identified by NWS most likely to be affected by severe thunderstorm, flash flood or tornado. Forecasters continually monitor radar to track the path of the storm and predict likely storm

development. The polygonal shape defining the location is then drawn by NWS forecasters.

7. ***NOAA Weather Radio***: A device of the National Oceanic and Atmospheric Administration with capability to broadcast NWS warnings, watches and additional hazard information 24 hours a day. Broadcast alerts are also conducted of non-weather emergencies, such as national security matters, Amber alerts, natural, environmental and public safety issues.

8. ***Simulcast*****:** The broadcasting of events across more than one medium, or more than one service, on the same medium, simultaneously (broadcast television and/or broadcast radio).

9. ***Storm Spotter*****:** Any individual who observes weather conditions for the purpose of reporting his or her observations to the NWS and/or emergency management agencies.

10. ***Tornado Warning*****:** Alert issued by weather services to warn of imminent nature of severe thunderstorms capable of producing tornadoes, or the actual sighting or indication on radar of a tornado in the warning area.

11. ***Tornado Watch*****:** Conditions are favourable for the formation of tornadoes, and significant risk of occurrence exists.

Appendix B: Public Readiness Index

Get your readiness quotient – "RQ" – by answering these 10 questions.

1. Does your local government have an emergency or disaster plan for your community?

- Yes
- No
- Don't Know

2. Do you know how to find the emergency broadcasting channel on the radio?

- Yes
- No

3. In the past 30 days, have you seen or heard any messages that encourage people to take steps to be prepared for emergency situations in your community?

- Yes
- No

	Done	Not Done	Not Sure
4. In the last year, have you prepared a Disaster Supply Kit with emergency supplies like water, food and medicine that is kept in a designated place in your home?			
5. In the last year, have you prepared a small kit with emergency supplies that you keep at home, in your car or where you work to take with you if you had to leave quickly?			
6. In the last year, have you made a specific plan for how you and your family would communicate in an emergency situation if you were separated?			
7. In the last year, have you established a specific meeting place to reunite in the event you and your family cannot return home or are evacuated?			
8. In the last year, have you practiced or drilled on what to do in an emergency at home?			

9. In the last year, have you volunteered to help prepare for or respond to a major emergency?

10. Have you taken first aid training such as CPR **in the past five years?**

Demographics

Age

Gender — Male — Female

City

State

Zip code

Country — United States

Are you currently:

Employed Full Time — Employed Part Time — Not Employed

Do you currently have school-aged children living in your home?

Yes — No

Appendix C: 2007 General Public Survey

<u>Emergency Situations:</u>

This information will assist in having a starting baseline for some of our community, and to assist in awareness training.

1. Have you ever been involved in an emergency situation as a result of a: Is this for Tennessee only or while you were on vacation?
    a. Hurricane
    b. Earthquake
    c. Tornado
    d. Flood
    e. Fire
    f. Disease
    g. Terrorist Attack
    h. None
    i. Other: __________________

2. When was the most recent time that you experienced one of the emergency situations listed in # 1?
    a. Within the past year
    b. 1 – 5 years
    c. 6 – 10 years
    d. 11 – 20 years
    e. 21 – 40 years
    f. 41+ years

3. Have you ever been in an emergency situation when <u>YOU</u>:
    a. Saw others injured or killed?
    b. Got injured?
    c. Provided first aid?
    d. Could not get in touch with other family members?
    e. Could not get to a store for three days or more?
    f. Lost electricity for the three days or more?
    g. Had to evacuate your community or neighborhood?
    h. Had to leave home for at least a night?
    i. Had to leave work?
    j. None of these
    k. Other important issue such as water supply

4. How likely do you think the following different emergency situations are to happen in our community in the next two years?

    a. Natural Disaster: (Hurricane, Earthquake, Tornado, Flood, Fire)
        i. Definitely Will
        ii. Probably Will
        iii. Probably Will Not
        iv. Definitely Will Not

    b. Terrorist Attack:
        i. Definitely Will
        ii. Probably Will
        iii. Probably Will Not
        iv. Definitely Will Not

    c. Public Health Emergency: (Infectious Disease Outbreak, Pandemic Influenza, or any other large-scale public health emergency)
        i. Definitely Will
        ii. Probably Will
        iii. Probably Will Not
        iv. Definitely Will Not

Evacuations:

This information will assist with the city's evacuation planning and community outreach efforts.

5. If you were instructed by government officials to evacuate to outside the metropolitan area, would you:
    a. Have NO place to stay and NO transportation
    b. Have a place to stay and have Transportation
    c. Have Transportation, BUT NO place to stay
    d. Have a place to stay, But No transportation

6. If you were instructed by government officials to evacuate your home due to an emergency situation to a shelter that could be reached by walking or public transportation, how LIKELY would you be to do so?
    a. Definitely Would
    b. Very Likely
    c. Somewhat Likely
    d. Somewhat Unlikely
    e. Very Unlikely
    f. Definitely Would Not

7. Why would you be UNLIKELY to evacuate?
    a. To protect my home
    b. Concerned about my possessions
    c. Have people in my care
    d. Concerned about my pets
    e. Concerned about crime / danger
    f. Concerned about food / water / supplies in shelter
    g. Not able to get to the shelter
    h. Have an alternate place to go
    i. Not knowing locations of pubic emergency shelters
    j. Lack of trust in the government
    k. Personal illness/disability
    l. Dislike of crowds
    m. Lack of transportation
    n. Think my home could withstand an event
    o. Have special needs that my prevent me from evacuating

Knowledge of Government Actions:

This information will assist in evaluating community outreach efforts.

8. Is there a tornado warning siren or some other emergency alert system in your community?
    a. Yes
    b. No
    c. I do not know

9. Does your local government have an emergency or disaster plan for your community?
    a. Yes
    b. No
    c. I do not know

10. Does your local government have an evacuation plan?
    a. Yes
    b. No
    c. I do not know

11. Have you ever heard of the County Emergency Management Office?
    a. Yes
    b. No
    c. I do not know

12. In the past 30 days, have you seen or heard any messages that encourage people to take steps to be prepared for emergency situations in your community?
    a. Yes
    b. No

13. Do you watch the Government Access TV?
    a. Yes
    b. No

14. What would you suggest as the best way for emergency messages to reach you?
    a. TV / News
    b. TV / Government Access Channel
    c. Email
    d. Internet
    e. Mass Telephone Calls
    f. Radio Stations
    g. Emergency Alert Weather Radio
    h. Highway Message Boards
    i. Community Siren System
    j. Other: ______________________________________

15. Would you and / or a family member take free emergency preparedness classes?
    a. Yes
    b. No
    c. Maybe

16. If so, when is the most convenient time?
    a. Daytime (8:00 am – 4:00 pm)
    b. Evening (5:00 pm - 10:00 pm)

17. When is the most convenient day?
    a. Monday – Friday
    b. Saturday
    c. Sunday

18. How confident are you with your LOCAL government being preparedness for major emergencies such as natural disasters or terrorist attacks?
    a. Very confident
    b. Somewhat confident
    c. Not confident
    d. Do not want to answer

19. What would be the best way to get information to you about emergency preparedness, free classes, seminars, etc.?
    a. TV / News
    b. TV / Government Access Channel
    c. Newspaper
    d. Email
    e. Radio
    f. Internet
    g. Other: ___________________________________

20. If Email, Enter valid email address here for emails:

    ____

21. Are you or anyone in your household a part of an active Neighborhood Watch Group?
    a. Yes
    b. No

22. If no, would you be interested in joining one?
    a. Yes
    b. No

23. Do you know how to report suspicious criminal and/or possible terrorist activity or who to call?
    a. Yes
    b. No
    c. Would not report it

Personal Preparedness:

This information will assist in better preparing our community for emergencies.

24. Do you know about or have an Emergency Alert Weather Radio at home?
    a. Yes
    b. No

25. Here is a short list of things that some people have done to prepare in the event of an emergency situation. What, if any, have you done to prepare?
    a. Prepared a disaster supply kit for at home
    b. Prepared a small disaster supply kit for the car
    c. Created a communication plan with the family
    d. Identified meeting locations for the family
    e. Practiced drills at home
    f. Taken a first aid class
    g. Taken an Emergency Preparedness Class
    h. Volunteered for emergency preparations (Such as emergency drills, etc.)
    i. Other: ___________________________________
    j. Nothing

26. If you have prepared a disaster supply kit for your home, which of the following do you currently have in your kit at home:
    a. Three (3) day supply of medicines
    b. Extra Batteries
    c. Flashlight
    d. Three (3) day supply of water
    e. Three (3) day supply of food
    f. First Aid Kit
    g. Weather Radio
    h. Standards AM / FM Radio
    i. Other

27. When was the last time you or a family member checked and/or updated the items in your disaster supply kit?
    a. Within the last month
    b. 2 – 6 months ago
    c. 7 – 12 months ago
    d. More than a year ago

28. If you do currently have a family communications plan, when was the last time you updated this plan and talked with your family about how you would communicate in an emergency?
    a. Within the last month
    b. 2 – 6 months ago
    c. 7 – 12 months ago
    d. More than a year ago

29. Does your plan to communicate with family members in an emergency include a specific person living outside your community that everyone knows to contact if they become separated?
    a. Yes
    b. No
    c. N/A

30. Here are some reasons that people often say for NOT doing things to prepare for an emergency situation like a terrorist act or natural disaster. Thinking about yourself, please indicate if any of the following is a MAJOR reason you have not done more:
    a. Do not think an emergency will happen here
    b. Do not know how to prepare
    c. Have not thought about it enough
    d. Nothing would be effective
    e. Got too much money
    f. Takes too much time
    g. Do not want to think about it
    h. Do not have room for an emergency kit
    i. Other

31. Thinking about yourself, please tell us if any of the following is a MAJOR reason you are well prepared:
    a. Live in a high risk area
    b. Been through emergency before
    c. Am responsible for children
    d. Am responsible for elderly / disabled
    e. I think it is important to be self – sufficient
    f. I think it is important to plan and prepare

32. If an emergency situation were to occur, who would you likely call for more information?
    a. 911
    b. Non-Emergency Phone Number
    c. Red Cross
    d. Emergency Management
    e. City Hall
    f. News Stations
    g. Community Hotlines as told on TV

33. Do you know how to turn off your utilities such as gas, electricity or water?
    a. Yes
    b. No

Employment:

This information will assist the government in better preparing our local businesses for possible emergency situations.

34. Are you currently:
    a. Employed Full Time
    b. Employed Part Time
    c. Self Employed
    d. Not Employed

35. How many people work at your specific office or place of business:
    a. Under 10
    b. 10 – 50
    c. 51 – 100
    d. 101 – 250
    e. 251 or more
    f. Varies

36. Does your employer have a detailed plan for how to respond in different emergency situations?
    a. Yes
    b. No
    c. Do not know

37. Does your employer have emergency supplies like non-perishable food and water in case employees must shelter in place at work?
    a. Yes
    b. No
    c. Do not know

38. Has there been any actual practice or drill of this plan at work in the last 12 months, or not?
    a. Yes
    b. No
    c. Do not know

39. Are you a government employee?
    a. Yes – Local Government
    b. Yes – State or Federal Government
    c. No

Schools:

This information will assist in better preparing our local schools.

40. How many children in your household go to daycare or school up through high school?
    a. None
    b. 1 – 2
    c. 3 – 4
    d. 5 +

41. Does your child's school or day care facility have a written plan for to respond in different emergency situations?
    a. Yes, all do
    b. Yes, some do
    c. No
    d. Do not know

42. Has there been any actual practice or drills of this plan at school within the last 12 months?
    a. Yes, all have
    b. Yes, some have
    c. No
    d. Do not know

43. Does the school have emergency supplies like non-perishable food and water in case students must shelter in place at school?
    a. Yes
    b. No
    c. Do not know

44. Has your family received any information about the plan (or any part of it) that the schools have within the last 12 months?
    a. Yes
    b. No
    c. Do not know

<u>Demographic Information:</u>

This *information will be of great assistance to your government in reaching out to the community in a more effective means. Reminder: It is all voluntary.*

45. Including yourself, how many people are currently living in your household?
    a. 1
    b. 2
    c. 3 or 4
    d. 4 or more
    e. Do not want to answer

46. Do you have anyone staying in your household that has special needs that may need assistance during an emergency situation?
    a. Yes
    b. No

47. What is your age?
    a. 18 – 24
    b. 25 – 34
    c. 35 – 44
    d. 45 – 54
    e. 55 – 64
    f. 65 +
    g. Do not want to answer

48. What is your gender?
    a. Male
    b. Female
    c. Do not want to answer

49. What is your zip code? ________________________

50. What is your Annual Household Income?
    a. Less than $ 15,000
    b. $ 15,000 - $24,999
    c. $ 25,000 - $ 34,999
    d. $ 35,000 - $ 49,999
    e. $ 50,000 – $ 74,999
    f. $ 75,000 - $ 99,999
    g. $ 100,000 or more

51. What is the highest grade of school or year of college that you have completed?
    a. None
    b. Less than High School
    c. High School / Vocational
    d. College Graduate
    e. Post Graduate
    f. Do not want to answer

52. What is your race?
    a. African – American / Black
    b. American Indian / Alaskan Native
    c. Asian
    d. Caucasian / White
    e. Hispanic / Latino
    f. Inter – Racial
    g. Pacific Islander
    h. Other: ___________________________________
    i. Do not want to answer

Appendix D: 2008 General Public Survey

Did you participate in this Emergency Preparedness Survey last year, 2007?

- ☐ No
- ☐ Yes

---

1. Have you ever personally been involved in an emergency situation before as a result of a:

- ☐ Hurricane
- ☐ Earthquake
- ☐ Tornado
- ☐ Flood
- ☐ Fire
- ☐ Disease
- ☐ Terrorist Attack
- ☐ None
- ☐ Other

If Other: ______________________________________

1.a.When was the most recent time that you experienced one of the emergency situations listed in #1?

- ☐ Within the past year
- ☐ 1 – 5 years
- ☐ 6 - 10 years
- ☐ 11 – 20 years
- ☐ 21 – 40 years
- ☐ 41 + years

2. **Have you ever been in an emergency situation when YOU:**

- ☐ Saw other injured or killed
- ☐ Got injured
- ☐ Provided first aid
- ☐ Could not get in touch with other family members
- ☐ Could not get to a store for three days
- ☐ Lost electricity for three days
- ☐ Had to evacuate your community or neighborhood
- ☐ Had to leave home for at least a night
- ☐ Had to leave work
- ☐ None of these

3. How likely do you think the following different emergency situations are to happen in our community in the next two years?

Natural Disaster

- ☐ Definitely Will
- ☐ Probably Will
- ☐ Probably Will Not
- ☐ Definitely Will Not

Terrorist Attack

- ☐ Definitely Will
- ☐ Probably Will
- ☐ Probably Will Not
- ☐ Definitely Will Not

Public Health Emergency

- ☐ Definitely Will
- ☐ Probably Will
- ☐ Probably Will Not
- ☐ Definitely Will Not

Evacuations

This information will assist with the city's evacuation planning and community outreach efforts.

4. If you were instructed by government officials to evacuate to outside the metropolitan area, would you:

- ☐ Have NO place to stay and NO transportation
- ☐ Have a place to stay and have transportation
- ☐ Have transportation, BUT NO place to stay
- ☐ Have a place to stay, BUT NO transportation

5. If you were instructed by government officials to evacuate your home to a shelter that could be reached by walking or public transportation, how LIKELY would you be to do so?

- ☐ Definitely Would
- ☐ Very Likely
- ☐ Somewhat Likely
- ☐ Somewhat Unlikely
- ☐ Very Unlikely
- ☐ Definitely Would Not

5.a. Why would you be UNLIKELY to evacuate?

- ☐ To protect my home
- ☐ Concerned about my possessions
- ☐ Have people in my care
- ☐ Concerned about my pets
- ☐ Concerned about crime/danger
- ☐ Concerned about food/water/supplies in shelter
- ☐ Not able to get to shelter
- ☐ Have alternate place to go
- ☐ Not knowing locations of public emergency shelters
- ☐ Lack of trust in government
- ☐ Personal illness
- ☐ Dislike of crowds
- ☐ Lack of transportation
- ☐ Think my home could withstand event
- ☐ Have special needs that may prevent evacuating

Knowledge of Government Actions

This information will assist in evaluating community outreach efforts.

6. Is there a tornado warning siren or some other emergency alert system in your community?

- ☐ Yes
- ☐ No
- ☐ Don't Know

7. Does your local government have an emergency or disaster plan for your community?

- ☐ Yes
- ☐ No
- ☐ Don't Know

8. Does your local government have an evacuation plan?

- ☐ Yes
- ☐ No
- ☐ Don't Know

9. Have you ever heard of the Office of Emergency Management in Nashville?

- ☐ Yes
- ☐ No
- ☐ Don't Know

10. In the past 30 days, have you seen or heard any messages that encourage people to take steps to be prepared for emergency situations in your community?

- ☐ Yes
- ☐ No

11. Do you watch Metro 3 Government Access TV?

- ☐ Yes
- ☐ No
- ☐ Don't know it existed, but will now

12. What would you suggest as the best way for emergency messages to reach you?

- ☐ TV/News
- ☐ TV/Government Access Channel
- ☐ Email
- ☐ Internet
- ☐ Mass Telephone Call
- ☐ Radio Station
- ☐ Emergency Alert Weather Radio
- ☐ Highway Message Board
- ☐ Other

If Other: ____

13. Would you and/or a family member take free emergency preparedness classes?

- ☐ Yes
- ☐ No
- ☐ Maybe

13.a. If so, when is the most convenient time?

- ☐ Daytime (8a-4p)
- ☐ Evening (5p-10p)

13.b. When is the most convenient day?

- ☐ Monday – Friday
- ☐ Saturday
- ☐ Sunday

14. How confident are you with your LOCAL government being prepared for major emergencies such as natural disasters or terrorist attacks?

- ☐ Very confident
- ☐ Somewhat confident
- ☐ Not confident
- ☐ Don’t want to answer

15. What would be the best way to get information to you about emergency preparedness, free classes, seminars etc.?

- ☐ TV/News
- ☐ TV/Government Access Channel 3
- ☐ Newspaper
- ☐ Email
- ☐ Radio
- ☐ Internet
- ☐ Other

If Other: ____

If Email, enter valid email address for OEM emails: ____________________

16. Are you or anyone in your household a part of an active Neighborhood Watch Group?

- ☐ Yes
- ☐ No

If no, would you be interested in joining one?

- ☐ Yes
- ☐ No

17. Do you know how to report suspicious criminal and/or possible terrorist activity, or who to call?

- ☐ Yes
- ☐ No
- ☐ Wouldn't report it.

Personal Preparedness

This information will assist in better preparing our community for emergencies.

18. Do you have an Emergency Alert Weather Radio at home?

- ☐ Yes
- ☐ No

19. Here is a short list of things that some people have done to prepare in the event of an emergency situation. What, if any, have you done to prepare?

- ☐ Prepared a disaster supply kit for at home
- ☐ Prepared a small disaster supply kit for the car
- ☐ Prepared a small disaster supply kit for the office
- ☐ Created a communication plan for family
- ☐ Identified meeting locations for family
- ☐ Practiced drills at home
- ☐ Taken a first aid class
- ☐ Taken a CERT class
- ☐ Volunteered for emergency preparation (such as emergency drills, etc.)
- ☐ Other
- ☐ Nothing

20. If you have prepared a disaster supply kit for your home, which of the following do you currently have in your kit at home:

- ☐ 3 day supply of medicine
- ☐ Extra Batteries
- ☐ Flashlight
- ☐ 3 day supply of water
- ☐ 3 day supply of food
- ☐ First Aid Kit
- ☐ Weather Radio
- ☐ Standard AM/FM radio

20.a. When was the last time you or a family member checked and/or updated the items in your disaster supply kit?

- ☐ Within the last month
- ☐ 2 – 6 months ago
- ☐ 7 - 12 months ago
- ☐ More than a year ago

21. If you do currently have a family communications plan, when was the last time you updated this plan and talked with your family about how you would communicate in an emergency?

- ☐ Within the last month
- ☐ 2 – 6 months ago
- ☐ 7 – 12 months ago
- ☐ More than a year ago

21.a. Does your plan to communicate with family members in an emergency include a specific person living outside your community that everyone knows to contact if they become separated?

- ☐ Yes
- ☐ No
- ☐ NA

22. Here are some reasons that people often say for NOT doing things to prepare for an emergency situation like a terrorist act or natural disaster. Thinking about yourself, please indicate if any of the following is a MAJOR reason you haven't done more.

- ☐ Don't think an emergency will happen here
- ☐ Don't know how to prepare
- ☐ Have not thought about it enough
- ☐ Nothing would be effective
- ☐ Cost too much money
- ☐ Takes too much time
- ☐ Don't want to think about it
- ☐ Don't have room for an emergency kit

23. Thinking about yourself, please tell us if any of the following is a MAJOR reason you are well prepared:

- ☐ Live in a high risk area
- ☐ Been through emergency before
- ☐ Am responsible for children
- ☐ Am responsible for elderly/disabled
- ☐ I think it is important to be self-sufficient

24. If an emergency situation were to occur, who would you likely call for more information?

- ☐ 9-1-1
- ☐ Non-emergency 862-8600
- ☐ Red Cross
- ☐ Emergency Management
- ☐ City Hall
- ☐ News Stations
- ☐ Community hotlines as told on TV
- ☐ Other
- ☐ None, would look for some other way of getting information

25. Do you know how to turn off your utilities such as gas, electricity or water?

- ☐ Yes
- ☐ No

Employment

This information will assist the government in better preparing our local businesses for possible emergency situations.

26. Are you currently:

- ☐ Employed full time
- ☐ Employed part time
- ☐ Self employed
- ☐ Not employed

26.a. How many people work at your specific office or place of business (best guess):

- ☐ Under 10
- ☐ 10 – 50
- ☐ 51 – 100
- ☐ 101 – 250
- ☐ 251 or more
- ☐ Varies

26.b. Does your employer have a detailed plan for how to respond in different emergency situations?

- ☐ Yes
- ☐ No
- ☐ Don’t know

26.c. Does your employer have emergency supplies like non-perishable food and water in case employees must shelter in place at work?

- ☐ Yes
- ☐ No
- ☐ Don’t know

26.d. Has there been any actual practice or drill of this plan at work in the last 12 months, or not?

- ☐ Yes
- ☐ No
- ☐ Don’t know

26.e. Are you a government employee?

- ☐ Yes – Local Government
- ☐ Yes – State or Federal Government
- ☐ No

Schools

This information will assist in better preparing our local schools.

27. How many children in your household go to daycare or school up through high school?

- ☐ None
- ☐ 1 – 2
- ☐ 3 – 4
- ☐ 5 +

27.a. Does your child's school or day care facility have a written plan for how to respond in different emergency situations?

- ☐ Yes, all do
- ☐ Yes, some do
- ☐ No
- ☐ Don't know

27.b. Has there been any actual practice or drills of this plan at school within the last 12 months?

- ☐ Yes, all have
- ☐ Yes, some have
- ☐ No
- ☐ Don't know

27.c. Does the school have emergency supplies like non-perishable food and water in case students must shelter in place at school?

- ☐ Yes
- ☐ No
- ☐ Don't know

27.d. Has your family received any information about this plan (or any part of it) the schools have within the last 12 months?

- ☐ Yes
- ☐ No
- ☐ Don't know

Demographic Information

This information will be of great assistance to your government in reaching out to the community in a more effective means. Reminder: It is all voluntary.

28. Including yourself, how many people are currently living in your household?

- ☐ 1
- ☐ 2
- ☐ 3
- ☐ 4 or more
- ☐ Don't want to answer

29. Do you have anyone staying in your household that has special needs that may need assistance during an emergency situation?

- ☐ Yes
- ☐ No

30. What is your age?

- ☐ 18 – 24
- ☐ 25 – 34
- ☐ 35 – 44
- ☐ 45 – 54
- ☐ 55 – 64
- ☐ 65 +
- ☐ Don't want to answer

31. What is your gender:

- ☐ Male
- ☐ Female
- ☐ Don't want to answer

32. What is your zip code: ___________________________

33. What is your Annual Household Income?

- ☐ Less than $ 15,000
- ☐ $15,000 – $24,999
- ☐ $25,000 - $34,999
- ☐ $35,000 - $49,999
- ☐ $50,000 - $74,999
- ☐ $75,000 - $99,999
- ☐ $100,000 or more

34. What is the highest grade of school or year of college that you have completed?

- ☐ None
- ☐ Less than high school
- ☐ High school/GED
- ☐ Some college/Vocational
- ☐ College Graduate
- ☐ Post Graduate
- ☐ Don’t want to answer

35. What is your race?

- ☐ African-American/Black
- ☐ American Indian/Alaskan Native
- ☐ Asian
- ☐ Caucasian/White
- ☐ Hispanic/Latino
- ☐ Inter-racial
- ☐ Pacific Islanders
- ☐ Other
- ☐ Don’t want to answer

Appendix E: 2010 General Public Survey

1. Is this your first time completing our Emergency Preparedness Survey?

    - ☐ Yes
    - ☐ No

Emergency Situations

2. Have you ever personally been involved in an emergency situation before as a result of a:

    - ☐ Hurricane
    - ☐ Earthquake
    - ☐ Tornado
    - ☐ Flood
    - ☐ Fire
    - ☐ Disease
    - ☐ Terrorist Attack
    - ☐ None
    - ☐ Other (Please specify): ____

3. Have you ever been in an emergency situation when YOU:

    - ☐ Saw others injured or killed?
    - ☐ Got injured yourself?
    - ☐ Provided first aid
    - ☐ Could not get in touch with other family members?
    - ☐ Could not get to a store for three days
    - ☐ Lost electricity for three days?
    - ☐ Had to evacuate your community or neighborhood?
    - ☐ Had to leave home for at least a night?
    - ☐ Had to leave work?
    - ☐ None of these?

4. How likely do you think the following different emergency situations are to happen in our community in the next two years?
    - Natural Disaster
        - Definitely Will
        - Probably Will
        - Probably Will Not
        - Definitely Will Not
    - Terrorist Attack
        - Definitely Will
        - Probably Will
        - Probably Will Not
        - Definitely Will Not
    - Public Health Emergency
        - Definitely Will
        - Probably Will
        - Probably Will Not
        - Definitely Will Not

5. How confident are you with your LOCAL government being prepared for major emergencies such as natural disasters or terrorist attacks?
    - Very confident
    - Somewhat confident
    - Not confident
    - Don't want to answer

6. If you were instructed by government officials to evacuate to outside the metropolitan area, would you:
    - Have NO place to stay and NO transportation to get there
    - Have a place to stay and have transportation to get there
    - Have transportation available, but NO place to stay
    - Have a place to stay, but NO transportation to get there

7. If you were instructed by government officials to evacuate your home to a shelter that could be reached by walking or public transportation, how likely would you be to do so?
    - Definitely would
    - Very likely
    - Somewhat likely
    - Somewhat unlikely
    - Very unlikely
    - Definitely would not

8. If you answered “Unlikely” to evacuate in the previous question, please explain why.
    - ☐ To protect my home
    - ☐ Concerned about my possessions
    - ☐ Have people in my care
    - ☐ Concerned about my pets
    - ☐ Concerned about food/water/supplies in shelter
    - ☐ Have alternate place to go
    - ☐ Not knowing locations of shelters
    - ☐ Lack of trust in government
    - ☐ Personal illness
    - ☐ Dislike of crowds
    - ☐ Lack of transportation
    - ☐ Think my home could withstand event
    - ☐ Have special needs that may prevent evacuating

9. Is there a tornado outdoor warning siren or some other emergency alert system in your community?
    - ☐ Yes
    - ☐ No
    - ☐ Don’t Know

10. Do you watch Metro 3 Government Access TV?
    - ☐ Yes
    - ☐ No
    - ☐ Didn’t know it existed, but will now

11. What would you suggest as the best way for emergency messages to reach you?
    - ☐ TV/News
    - ☐ TV/ Government Access Channel
    - ☐ Email
    - ☐ Text Messages
    - ☐ Internet
    - ☐ Mass Telephone Calls
    - ☐ Radio Stations
    - ☐ Emergency Alert Weather Radio
    - ☐ Highway Message Boards
    - ☐ Other (Please specify): ________________________________

12. Would you and/or a family member take free emergency preparedness classes and similar?
    - ☐ Yes
    - ☐ No
    - ☐ Maybe

13. If you are interested in attending free classes, when is it convenient?
    - ☐ Monday – Friday
        - ☐ Daytime (8a-4p)
        - ☐ Evening (5p-10p)
    - ☐ Saturday
        - ☐ Daytime (8a-4p)
        - ☐ Evening (5p-10p)
    - ☐ Sunday
        - ☐ Daytime (8a-4p)
        - ☐ Evening (5p-10p)

14. What would be the best way to get information to you about emergency preparedness, free classes, seminars, etc.?
    - ☐ TV/News
    - ☐ TV/Government Access Channel
    - ☐ Newspaper
    - ☐ Email
    - ☐ Text Messages
    - ☐ Radio
    - ☐ Internet
    - ☐ Other (Please specify): ____________________________________

15. If you would like to sign up to receive information (from the Office of Emergency Management) about free citizen preparedness class opportunities, please enter your email address below.

    ____

16. Are you or anyone in your household a part of an active Neighborhood Watch Group?
    - ☐ Yes
    - ☐ No

17. If you answered “No” to the previous question, would you be interested in joining a Neighborhood Watch Group?
    - ☐ Yes
    - ☐ No

18. Do you have an Emergency Alert Weather Radio at home?
    - ☐ Yes
    - ☐ No

19. Here is a short list of things that some people have done to prepare in the event of an emergency situation. What, if any, have you done to prepare?
    - ☐ Prepared a disaster supply kit for at home
    - ☐ Prepared a smaller disaster supply kit for the car
    - ☐ Prepared a smaller disaster supply kit for the office
    - ☐ Created a communication plan for family
    - ☐ Identified meeting locations for family
    - ☐ Practiced drills at home
    - ☐ Taken a first aid class
    - ☐ Volunteered for emergency preparations (such as emergency drills or actual emergencies, etc.)
    - ☐ Other (Please specify): ____

20. If you have prepared a disaster supply kit for at home, which of the following do you currently have in your kit?
    - ☐ 3 day supply of medicines
    - ☐ Extra batteries
    - ☐ Flashlight
    - ☐ 3 day supply of water
    - ☐ First Aid Kit
    - ☐ Standard AM/FM radio

21. Thinking about yourself, please tell us if any of the following is a MAJOR reason you ARE well prepared:
    - ☐ Live in a high risk area
    - ☐ Been through an emergency before
    - ☐ Am responsible for children
    - ☐ Am responsible for elderly/disable
    - ☐ I think it is important to be self-sufficient

22. Here are some reasons that people often say for NOT doing things to prepare for an emergency situation like a terrorist act or natural disaster. Thinking about yourself, please indicate if any of the following is a MAJOR reason you haven't done more.
    - Don't think an emergency will happen here
    - Don't know how to prepare
    - Have not thought about it enough
    - Nothing would be effective
    - Cost too much money
    - Takes too much time
    - Don't want to think about it
    - Don't have room for an emergency kit

23. Do you know how to turn off your utilities such as gas, electricity or water?
    - Yes
    - No

Employment

24. Are you currently:
    - Employed full time
    - Employed part time
    - Self employed
    - Not employed

25. How many people work at your specific office or place of business (best guess):
    - Under 10
    - 10 – 50
    - 51 – 100
    - 101 – 250
    - 251 or more
    - Varies
    - N/A

26. Does your employer have a detailed plan for how to respond in different emergency situations?
    - Yes
    - No
    - Don't know

27. Has there been any actual practice or drill plan at work in the last 12 months?
    - ☐ Yes
    - ☐ No
    - ☐ Don't know

28. Are you a government employee?
    - ☐ Yes – Local Government
    - ☐ Yes – State or Federal Government
    - ☐ No

Demographics

29. Including yourself, how many people are currently living in your household?
    - ☐ 1
    - ☐ 2
    - ☐ 3
    - ☐ 4 or more
    - ☐ Don't want to answer

30. How many children in your household go to daycare or school up through high school?
    - ☐ None
    - ☐ 1 - 2
    - ☐ 3 – 4
    - ☐ 5 +

31. Do you have anyone staying in your household that has special needs that may need assistance during an emergency
    - ☐ Yes
    - ☐ No

32. What is your age?
    - ☐ 18 – 24
    - ☐ 25 - 34
    - ☐ 35 – 44
    - ☐ 45 – 54
    - ☐ 55 – 64
    - ☐ 65 +
    - ☐ Don't want to answer

33. What is your gender?
    - ☐ Male
    - ☐ Female
    - ☐ Don’t want to answer

34. What is your zip code: ______________________________

35. What is your Annual Household Income:
    - ☐ Less than $15,000
    - ☐ $15,000 - $24,999
    - ☐ $25,000 - $34,999
    - ☐ $35,000 - $49,999
    - ☐ $50,000 - $74,999
    - ☐ $75,000 - $99,999
    - ☐ $100,000 or more
    - ☐ Don’t want to answer

36. What is the highest grade of school or year of college that you have completed?
    - ☐ Less than high school
    - ☐ High school graduate/GED
    - ☐ Some college/vocational
    - ☐ College or Professional School Graduate
    - ☐ Don’t want to answer

37. What is your race?
    - ☐ Asian
    - ☐ Caucasian/White
    - ☐ Hispanic/Latino
    - ☐ Inter-racial
    - ☐ Pacific Islander
    - ☐ Other
    - ☐ Don’t want to answer

Appendix F: Broadcast Media Survey

Station Demographics

1. What type of broadcast media does your organization represent?
   - ☐ Television
   - ☐ Radio
   - ☐ Other

   If other, please specify: ____

2. What is the catchment or coverage area for your station? (You may select multiple answers.)
   - ☐ Memphis Area
   - ☐ Jackson Area
   - ☐ Nashville Area
   - ☐ Cookeville Area
   - ☐ Johnson City Area
   - ☐ Knoxville Area
   - ☐ Chattanooga Area
   - ☐ Everywhere Else

   Everywhere Else, please specify: ____________________________________

3. What is the population of your potential viewing / listening audience in your area?

   - ☐ 0 – 9,999
   - ☐ 10,000 – 49,999
   - ☐ 50,000 – 99,999
   - ☐ 100,000 – 499,999
   - ☐ 500,000 – 999,999
   - ☐ 1,000,000 – 1,499,999
   - ☐ 1,500,000 +

Station Operational Protocol

4. Who within your broadcasting organization receives local emergency alerts? (You may select multiple answers.)
   - ☐ Weather Centre
   - ☐ News Department
   - ☐ General Announcement/Staff
   - ☐ Emergency Alert System (EAS)
   - ☐ Other

   If other, please specify: ____

5. Who within your broadcasting organization relays or transmits local emergency alerts to the general public? (You may select multiple answers.)
   - ☐ Weather Centre
   - ☐ News Department
   - ☐ General Announcement/Staff
   - ☐ Emergency Alert System (EAS)
   - ☐ Other

   If other, please specify: ____

6. How is your station staffed?
   - ☐ 24/7
   - ☐ Daytime Only
   - ☐ Other

   If other, please specify: ____

7. When your station is not staffed, how would you notify the general public of severe weather watches and/or warnings that may impact your viewing / listening area? (You may select multiple answers.)
   - ☐ Don't Know
   - ☐ Do not have the capability to interrupt recorded broadcasting
   - ☐ Have the capability to interrupt recorded broadcasting with information from the National Weather Service
   - ☐ Have the ability to bring in staff as needed
   - ☐ Not Applicable
   - ☐ Other

   If other, please specify: ____

8. Does your station have a policy and/or procedure established to pass through non-weather alerts to the general public (i.e. Amber Alerts, Evacuations, etc.)?
   - ☐ No
   - ☐ Yes

9. Does your station have access to emergency generators for back-up power supply?
   - ☐ No
   - ☐ Yes

Severe Weather Emergencies

10. How do you get advanced notice that severe weather is going to impact your viewing/listening area? (You may select multiple answers.)
    - ☐ No advance notice
    - ☐ NOAA Weather Radio
    - ☐ Internet Private
    - ☐ Internet Government
    - ☐ Conference Call with Local Emergency Management Agency (EMA)
    - ☐ Other

    If other, please specify: ____

11. Where does emergency alert information originate? (You may select multiple answers.)
    - ☐ National Weather Service
    - ☐ Local TV Station
    - ☐ Local Emergency Management or Other Public Safety Agencies
    - ☐ Weather Spotters
    - ☐ HAM Radio
    - ☐ Web/.Internet
    - ☐ Other Broadcast Station(s) in the Area
    - ☐ Contract Services
    - ☐ Other

    If other, please specify: ____

12. What type(s) of warning systems exist in your community to alert the general public about severe weather? (You may select multiple answers.)
    - ☐ Don’t Know
    - ☐ Siren System
    - ☐ Hardwired Telephone Notification
    - ☐ Broadcast Television
    - ☐ Broadcast Radio
    - ☐ NOAA Weather Radio
    - ☐ Internet/Government
    - ☐ Cell phone/Text Messaging
    - ☐ Other

    If other, please specify: ____

13. Broadcast stations have established triggers for severe weather alerts for their viewing/listening audience. What are the triggers for getting information to your audience? (You may select multiple answers.)
    - ☐ When your area is outlooked for severe weather by the Storm Prediction Centre
    - ☐ When a severe weather watch is issued by the Storm Prediction Centre
    - ☐ When a severe weather warning is issued by the National Weather Service
    - ☐ When the community alert siren system is activated by the Emergency Management Office
    - ☐ When a tornado has been spotted in the viewing / listening area
    - ☐ Other

    If other, please specify:_____________________________________

14. How is a severe weather watch broadcast to the general public? (You may select multiple answers.)
    - ☐ No Announcement
    - ☐ NOAA Weather Radio/Emergency Alert System (EAS)
    - ☐ Civil Authority
    - ☐ Station News/Weather Reports
    - ☐ General Announcement/Air Personalities/Staff
    - ☐ Closed Captioning
    - ☐ Crawler on the bottom of their television screen
    - ☐ Other

    If other, please specify: ______________________________________

15. How frequently are alerts broadcasted during a severe weather watch?
    - ☐ Once an hour
    - ☐ Twice an hour
    - ☐ Four times an hour
    - ☐ As needed
    - ☐ Other

    If other, please specify: _______________________________________

16. How is a severe weather warning broadcast to the general public? (You may select multiple answers.)
    - ☐ No Announcement
    - ☐ NOAA Weather Radio / Emergency Alert System (EAS)
    - ☐ Civil Authority
    - ☐ Station News / Weather Reports
    - ☐ General Announcement / Air Personalities
    - ☐ Closed Captioning
    - ☐ Crawler on the bottom of the television screen
    - ☐ Other

    If other, please specify: _____________________________________

17. How frequently are alerts broadcasted during a severe weather warning?
    - ☐ Once an hour
    - ☐ Twice an hour
    - ☐ Four times an hour
    - ☐ As needed
    - ☐ Other

    If other, please specify: _____________________________________

18. When do you communicate to your viewing / listening audience that a severe weather warning has been cancelled or has expired (all clear status)?
    - ☐ Don't Know
    - ☐ When the rain stops
    - ☐ Upon notification from Local Emergency Management / Other Public Safety Agency
    - ☐ When the National Weather Service severe weather warning expires or is cancelled
    - ☐ Other

    If other, please specify: ____

Knowledge of the National Weather Service (NWS)

19. Thinking about the National Weather Service (NWS) weather forecast you use most often, how satisfied or dissatisfied are you with the following:

N/A	Don't Know	Not Satisfied	Somewhat Satisfied	Very Satisfied
The NWS forecast provides the information you need.				
Severe weather information is provided in a timely manner.				
Severe weather information is accurate for your viewing / listening audience.				

Additional Comments:

20. Over the last five years or so, do you think the weather forecasts overall have become…?
    - ☐ A lot more accurate
    - ☐ A little more accurate
    - ☐ Has stayed the same
    - ☐ A little less accurate
    - ☐ A lot less accurate

Knowledge of the Emergency Alert System (EAS)

21. The Common Alerting Protocol (CAP) is a new digital messaging format for exchanging Emergency Alert System (EAS) public warnings and emergencies. Is your EAS alerting equipment CAP compatible?
    - ☐ No
    - ☐ Yes
22. Will your station have to purchase additional equipment to be CAP compliant?
    - ☐ No
    - ☐ Yes

23. Are you aware of a scheduled National Emergency Alert System (EAS) test?
    - ☐ No
    - ☐ Yes

24. Should there be public outreach about the National Emergency Alert System (EAS) test?
    - ☐ No
    - ☐ Yes

Level of Preparedness

25. When was the last time you met with local authorities about your emergency alerting capabilities / plan?
    - ☐ Don't Know
    - ☐ Within the last 30 days
    - ☐ Within the last 6 months
    - ☐ Within the last year
    - ☐ Other

    If other, please specify: ____

26. Have you participated in severe weather exercises (tabletop, functional, or full-scale) within your community?
    - ☐ No
    - ☐ Yes, Tabletop
    - ☐ Yes, Functional
    - ☐ Yes, Full-scale
    - ☐ Yes, Other

    If other, please specify:____

27. In working with non-English speaking populations in your viewing / listening area, do you have the capability to provide information in various native languages:
    - ☐ Don't Know
    - ☐ No
    - ☐ Yes

    If yes, please list examples of ongoing initiatives:

Appendix G: Emergency Management Survey

Agency Demographics

1. Where is your Emergency Management Agency office located?
   ____
   Elsewhere (please specify): _____________________________

2. What is the population of your county?
   - ☐ 0 – 4,999
   - ☐ 5,000 - 9,999
   - ☐ 10,000 – 24,999
   - ☐ 25,000 - 49,999
   - ☐ 50,000 – 74,999
   - ☐ 75,000 - 99,999
   - ☐ 100,000 – 249,999
   - ☐ 250,000 - 499,999
   - ☐ 500,000 – 749,999
   - ☐ 750,000 - 999,999
   - ☐ 1,000,000 – 1,4999,999
   - ☐ 1,500,000 +

Agency Operational Protocols

3. Who within your county agency receives information about local emergency alerts for your area? (You may select multiple answers.)
   - ☐ Director of the County Emergency Management Agency
   - ☐ Assistant Director of the County Emergency Management Agency
   - ☐ County Emergency Management Staff
   - ☐ County Senior Elected Officials
   - ☐ Other

   If other, please specify:

4. Who within your county agency relays information about the local emergency alert to the broadcast media (Television / Radio / Other)? (You may select multiple answers.)
   - ☐ Director of the County Emergency Management Agency
   - ☐ Assistant Director of the County Emergency Management Agency
   - ☐ County Emergency Management Staff
   - ☐ Public Information Officer (PIO)
   - ☐ County Senior Elected Officials
   - ☐ NOAA Weather Radio /Emergency Alert System (EAS)
   - ☐ N/A
   - ☐ Other

   If other, please specify: ____________________________________

5. Who within your county agency relays information about the local emergency alert to the general public? (You may select multiple answers.)
   - ☐ Don't Know
   - ☐ Director of the County Emergency Management Agency
   - ☐ Assistant Director of the County Emergency Management Agency
   - ☐ County Emergency Management Staff
   - ☐ Public Information Officer (PIO)
   - ☐ County Senior Elected Officials
   - ☐ NOAA Weather Radio /Emergency Alert System (EAS)
   - ☐ Other

   If other, please specify: ___________________________________

6. Is the County Emergency Manager position paid or volunteer?
   - ☐ Paid
   - ☐ Volunteer

7. How is your agency staffed?
   - ☐ 24 / 7
   - ☐ Daytime Only
   - ☐ Other

   If other, please specify: _____________________________________

8. How many staff do you have in your County Emergency Management Agency?
   - ☐ 1-2
   - ☐ 3-4
   - ☐ 5-6
   - ☐ 7+
   - ☐ Other

   If other, please specify: ______________________________________

9. Does your County Emergency Management Agency have a policy and/or procedure established to get non-weather alerts to the general public (i.e.- Amber Alerts, Evacuations, etc.)?
   - ☐ No
   - ☐ Yes

10. Does your County Emergency Management Agency's Emergency Operations Centre (EOC) office have access to emergency generators for back-up power supply?
    - ☐ Do not have an Emergency Operations Centre (EOC)
    - ☐ No
    - ☐ Yes

Severe Weather Emergencies

11. Where do you get your advance notice that severe weather is going to impact your county / area? (You may select multiple answers.)
    - ☐ No advance notice
    - ☐ NOAA Weather Radio / Emergency Alert System (EAS)
    - ☐ National Weather Service (NWS)
    - ☐ Local Broadcast Television Station
    - ☐ Local Broadcast Radio Station
    - ☐ Internet Private
    - ☐ Internet Government
    - ☐ Conference Call with State Emergency Management Agency
    - ☐ N/A
    - ☐ Other

    If other, please specify:_______________________________________

12. Where does emergency alert information originate? (You may select multiple answers.)
    - ☐ National Weather Service (NWS)
    - ☐ Local Broadcast TV Station
    - ☐ Local Broadcast Radio Station
    - ☐ State Emergency Management
    - ☐ Weather Spotters
    - ☐ HAM Radio Operators
    - ☐ Web / Internet
    - ☐ Contract Service
    - ☐ Other

    If other, please specify: ____

13. What type(s) of warning system exist in your county to alert the general public about severe weather? (You may select multiple answers.)
    - ☐ Don't Know
    - ☐ Siren System
    - ☐ Hardwired Telephone Notification
    - ☐ Broadcast Television
    - ☐ Broadcast Radio
    - ☐ NOAA Weather Radio
    - ☐ Internet / Government
    - ☐ Cell Phone / Text Messaging
    - ☐ Other

    If other, please specify: ____

14. You have a power outage throughout your county due to a severe weather emergency, what are your backup plans to get emergency information to the general public? (You may select multiple answers.)
    - ☐ Face-to-Face communications
    - ☐ Word of mouth from neighbours, family and friends
    - ☐ Local Response Agencies using Public Address (PA) Systems within their vehicles
    - ☐ Newspaper
    - ☐ Broadcast Radio Stations
    - ☐ Broadcast Television Stations
    - ☐ Other

    If other, please specify: ____

15. How confident are you that the LOCAL Broadcast Media (Television / Radio / Other) is going to convey the appropriate message to the general public about severe weather that may impact your county / area?
    - ☐ Not Confident
    - ☐ Somewhat Confident
    - ☐ Very Confident
    - ☐ N/A

16. Emergency Management Agencies have established triggers for severe weather alerts for their county / area. What are the triggers for getting information to the general public? (You may select multiple answers.)
    - ☐ When your area is outlooked for severe weather by the Storm Prediction Centre
    - ☐ When a severe weather watch is issued by the Storm Prediction Centre
    - ☐ When a severe weather warning is issued by the National Weather Service
    - ☐ When a tornado has been spotted in the area
    - ☐ N/A
    - ☐ Other

    If other, please specify: ____

17. What other agencies assist your agency in notifying the general public about severe weather emergencies? (You may select multiple answers.)
    - ☐ Local Law Enforcement
    - ☐ State Law Enforcement
    - ☐ State Emergency Management Agency
    - ☐ Fire Department
    - ☐ Emergency Medical Services
    - ☐ County Senior Elected Officials
    - ☐ County 911
    - ☐ HAM Radio Operators
    - ☐ Weather Spotters
    - ☐ N/A
    - ☐ Other

    If other, please specify:____

18. How is a severe weather watch communicated to the general public? (You may select multiple answers.)
    - ☐ No Announcement
    - ☐ NOAA Weather Radio / Emergency Alert System (EAS)
    - ☐ National Weather Service (NWS)
    - ☐ Civil Authority
    - ☐ TV / Government Access Channel
    - ☐ Email
    - ☐ Text Messages
    - ☐ Internet
    - ☐ Mass Telephone Calls
    - ☐ HAM Radio Operators
    - ☐ Local Broadcast Radio Stations
    - ☐ Local Broadcast Television Stations
    - ☐ Highway Message Boards
    - ☐ Crawler on the bottom of the television screen
    - ☐ N/A
    - ☐ Other

    If other, please specify: ___________________________________

19. How frequent are the alerts sent out to the general public during a severe weather watch?
    - ☐ Every 60 minutes
    - ☐ Every 30 minutes
    - ☐ Every 15 minutes
    - ☐ Every 10 minutes
    - ☐ As needed
    - ☐ N/A
    - ☐ Other

    If other, please specify:_______________________________________

20. How is a severe weather warning communicated to the general public? (You may select multiple answers.)
    - ☐ No Announcement
    - ☐ NOAA Weather Radio / Emergency Alert System (EAS)
    - ☐ National Weather Service (NWS)
    - ☐ Civil Authority
    - ☐ TV / Government Access Channel
    - ☐ Email
    - ☐ Text Messages
    - ☐ Internet
    - ☐ Mass Telephone Calls
    - ☐ HAM Radio Operators
    - ☐ Local Broadcast Radio Stations
    - ☐ Local Broadcast Television Stations
    - ☐ Highway Message Boards
    - ☐ Crawler on the bottom of the television screen
    - ☐ N/A
    - ☐ Other

    If other, please specify:____________________________________

21. How frequent are the alerts broadcast during a severe weather warning?
    - ☐ Every 60 minutes
    - ☐ Every 30 minutes
    - ☐ Every 15 minutes
    - ☐ Every 10 minutes
    - ☐ As needed
    - ☐ N/A
    - ☐ Other

    If other, please specify: ____

22. When do you communicate to the general public that a severe weather warning has been cancelled or has expired (all clear status)?
    - ☐ Don't Know
    - ☐ When the rain stops
    - ☐ Upon notification from State Emergency Management / Other Public Safety Agency
    - ☐ When the National Weather Service severe weather warning expires or is cancelled
    - ☐ N/A
    - ☐ Other

    If other, please specify:____

Knowledge of the National Weather Service (NWS)

23. Thinking about the National Weather Service (NWS) weather forecast you use most often, how satisfied or dissatisfied are you with the following:

	Don't Know	Not Satisfied	Somewhat Satisfied	Very Satisfied	N/A
The NWS forecast provides the information you need.					
Severe weather information is provided in a timely manner.					
Severe weather information is accurate for your viewing / listening audience.					

Additional Comments:

24. Over the last five years or so, do you think the weather forecasts overall have become…?
    - ☐ A lot more accurate
    - ☐ A little more accurate
    - ☐ Has stayed the same
    - ☐ A little less accurate
    - ☐ A lot less accurate

Knowledge of the Emergency Alert System (EAS)

25. The Common Alerting Protocol (CAP) is a new digital messaging format for exchanging Emergency Alert System (EAS) public warnings and emergencies. Is your EAS alerting equipment CAP compatible?
    - ☐ Don't Know
    - ☐ No
    - ☐ Yes

26. Are you aware of a scheduled National Emergency Alert System (EAS) test?
    - ☐ No
    - ☐ Yes

27. Should there be public outreach about the National Emergency Alert System (EAS) test?
    - ☐ No
    - ☐ Yes

Level of Preparedness

28. When was the last time you met with Local Broadcast Television / Radio Stations in your area about emergency alerting capabilities / plan?
    - ☐ Don't Know
    - ☐ Within the last 30 days
    - ☐ Within the last 6 months
    - ☐ Within the last year
    - ☐ Other

    If other, please specify: ____

29. Have Local Broadcast Television / Radio Stations been involved in your severe weather exercises (tabletop, functional or full-scale) within your community? (You may select multiple answers.)
    - ☐ No
    - ☐ Yes, Tabletop
    - ☐ Yes, Functional
    - ☐ Yes, Full-scale
    - ☐ Yes, Other

    If other, please specify: ____

30. Special needs / vulnerable populations should be notified by the most expedient means possible. Are the following areas addressed in your disaster planning process? (You may select multiple answers.)
    - ☐ Established “Registry” for the special needs / vulnerable populations
    - ☐ Established communication networks with caregivers (professional and non-professionals), care giving organizations and family members for delivering disaster / severe weather notifications and alerts
    - ☐ Provided essential conduits for distribution of disaster preparedness / severe weather information
    - ☐ Understand the resource and culture needs of the given population
    - ☐ Identified necessary resources needed for transportation and evacuation
    - ☐ Identified shelter facilities with appropriate support services
    - ☐ Status checks on elderly and disabled persons living alone who may be at risk (pre- and post-incident)

    Give examples of local initiatives either underway or completed:

31. In working with non-English speaking populations in the area of disaster preparedness and severe weather notifications and alerts, have you: (You may select multiple answers.)
    - ☐ Provided disaster / severe weather information in various native languages.
    - ☐ Identified information sites in area neighbourhoods to assist in building relationships and social networks with population-based groups.
    - ☐ Provided technical assistance to leaders of non-English speaking communities.
    - ☐ Engaged community stakeholders (local television stations, radio stations, newspapers, healthcare professionals, faith based organizations, etc.) in disaster preparedness and severe weather notification initiatives.

List examples of on-going initiatives you have for non-English speaking communities: (please specify)

Appendix H: Focus Group Format

Introduction

My name is Stephen Guillot, Jr., I am a doctoral student at the University of Glamorgan in Pontypridd, Wales and the group leader for this focus group.

Dr. Sheila Ridner, PhD Nurse Researcher, will assist in conducting this focus group. Mrs. Sheri Guillot and Ms. Dawn Thornton are assisting with the transcriptionist for this focus group.

At this time, would each of the focus group participants introduce themselves by telling us your name.

I am conducting research for my dissertation titled*: Emergency Warning System: Factors Influencing Citizen Decision-Making*. Thank you for your participation in a focus group to provide your expertise in the areas of experience and knowledge of disasters; level of preparedness, emergency alert and notification communication strategy; and perceived risk associated with disasters.

Project Overview

An essential element for effective disaster preparedness requires addressing the need for an emergency warning system and emergency communications to the general public. Emergency situations can and do happen any time, at any location, and can affect only a few people, or mass populations.

The focus group aims to assess the response and preparedness of broadcast organizations and county emergency management agencies to inform the general public of a potential emergency / severe weather event that may impact their area. Two areas of concentration will incorporate behavior patterns of television / radio broadcasters, and county emergency management agencies; and their knowledge of emergency preparedness and alert / notification resources available.

The primary focus will consist of the identification, selection, and testing of certain factors for assessing those determined as most appropriate to ensuring optimal system efficiency. A review of the components associated with early warning systems will be conducted, such as: risk knowledge; local vulnerability; appropriate protection actions, and human behavior.

Inform Consent Information

You have all been given a copy of the inform consent document to complete and return to me. It is up to you to decide whether or not to take part. If you do decide to take part you will be given this information sheet to keep (and be asked to sign a consent form). If you decide to take part you are still free to withdraw at any time, and without giving a reason. You can withdraw by calling me at (615) 260-6021 and your data will not be used.

All information which is collected about you during the course of the research will be kept strictly confidential. Any information about you which is disseminated will have your name and address removed so that you cannot be recognized from it.

Thank you for meeting with us today to talk about the “Emergency Warning System: Factors Influencing Citizen Decision-Making.” We’re going to ask a few open ended questions, and we would like you to respond and discuss while we record what you are saying. We hope you feel free to say whatever you think: if you have something critical to say, please say it. If you’d rather talk to us one on one, we’d be happy to arrange that, too.

For today’s focus group discussion, in order to be recognized, please state your first name and the group leader will recognize you. Upon recognition, please contribute to the discussion. This will make it easier for the transcriptionist to document the focus group conversation.

We want to make sure that we document everything you want to tell us, but we also need to make sure that everyone who wants to, gets a chance to talk today. We also want to make sure we get a chance to ask all our questions.

Any questions before we get started?

This is a structured interview. When there is no new information from the group, I will move on to the next question.

Appendix I: Informed Consent Form

Dear Focus Group Participant,

My name is Stephen Guillot, Jr., and I am a doctoral student at the University of Glamorgan in Pontypridd, Wales. I am conducting research for my dissertation titled*: Emergency Warning System: Factors Influencing Citizen Decision-Making*. I am requesting your participation in a focus group to provide your expertise in the areas of experience / knowledge of disasters, level of preparedness and perceived risk. If you choose to participate, you will be part of a group of individuals representing the general public, broadcast media and county emergency management agency.

Project Overview

An essential element for effective disaster preparedness requires addressing the need for an emergency warning system and emergency communications to the general public. Emergency situations can and do happen any time, at any location, and can affect only a few people, or mass populations.

The focus group aims to assess the response and preparedness of broadcasting organizations and county emergency management agency to inform the general population of a potential emergency / severe weather warning within the state of Tennessee. Two areas of concentration will incorporate behavior patterns of television / radio broadcasters, county emergency management agency, and support agencies making up that population, and the emergency preparedness knowledge and resource level. The primary focus will consist of the identification, selection and testing of certain factors for assessing those determined as most appropriate to ensuring optimal system efficiency. A review of the components associated with early warning systems will be conducted, such as: risk knowledge; local vulnerability; appropriate protection actions and human behavior.

Next Steps

If you choose to participate in the focus group, **please read and fill in your name / date on the attached Informed Consent Form**. Once I receive your return e-mail, within a week, you will receive a follow-up e-mail outlining the next steps in conducting the focus group. Although this may vary from focus group to focus group, I expect that an estimate of your total time commitment for this project to be one to two hours.

Again, thank you for your participation. I am excited about the project, and welcome your input. If you have questions, feel free to contact me at (615) 260-6021.

Sincerely,

Stephen Guillot, Jr.

Informed Consent Form:

Emergency Warning System: Factors Influencing Citizen Decision-Making

Purpose. You are invited to participate in a research study being conducted for a doctoral dissertation at the University of Glamorgan in Pontypridd, Wales. The purpose of this study is to assess the response and preparedness of broadcasting organizations and county emergency management agency to inform the general population of a potential emergency / severe weather warning within the state of Tennessee. Two areas of concentration will incorporate behavior patterns of television / radio broadcasters, county emergency management agency, and support agencies making up that population, and the emergency preparedness knowledge and resource level. The primary focus will consist of the identification, selection and testing of certain factors for assessing those determined as most appropriate to ensuring optimal system efficiency. A review of the components associated with early warning systems will be conducted, such as: risk knowledge; local vulnerability; appropriate protection actions and human behavior.

Participation requirements. You will be asked to attend and participate in a focus group made up of individuals representing the general public, broadcast media and the county emergency management agency.

Research Personnel. The following people are involved in this research project and may be contacted at any time: Principal Investigator- Stephen Guillot, Jr., e-mail: stephen.guillot@vanderbilt.edu phone: (615) 260-6021; the Chair of my Dissertation Committee, Dr. Joyce Kenkre, University of Glamorgan, e-mail: jkenkre@glam.ac.uk, and Dr. Sheila Ridner, email sheila.ridner@vanderbilt.edu.

Potential Risk/ Discomfort. There are no known risks in this study. However, you may withdraw at any time and you may choose not to answer any question that you feel uncomfortable in answering.

Potential Benefit. The direct benefits to you of participating in this research will be the satisfaction of helping to evaluate the existing emergency warning system capability and capacity to notify the general public of severe weather in a timely manner.

Anonymity/ Confidentiality. The data collected in this study are confidential. All data are coded such that your name is not associated with them. In addition, the coded data are made available only to the researchers associated with this project. This aids in preserving confidentiality and limits any specter of group think or peer pressure.

Right to Withdraw. Please be advised that you have the right to withdraw from the study at any time without penalty. Additionally, you may decide not to answer any of the questions asked during the focus groups if you do not want to answer them or participate in the discussion related to a certain question.

Acknowledgment:

I have read the above description of the Emergency Warning System: Factors Influencing Citizen Decision-Making study and understand the conditions of my participation. By typing / signing my name at the bottom of this form, and returning it via e-mail, I indicate that I voluntarily agree to participate in this research project.

Participant’s Name:	Date:

Appendix J: Public Focus Group #1

Question 1:
Have you ever personally been involved in a severe weather emergency such as tornadoes, ice storm, flooding, etc.? If so, did this experience impact your level of preparedness for future emergencies? If so, how?

Question 2:
If you were told by a government agency to leave your area within five (5) minutes or you will die, would you leave? If not, why? If so, when will you leave, where will you go and how will you get there? Would you leave because of the risk associated with the emergency?

Question 3:
Where do you get up-to-date severe weather alerts and weather information? What station would you get severe weather updates from? How do you view the quality of the information received? How do you view the timeliness of the information? Is this information easy to understand and interpret?

Question 4:
What is your understanding of a "tornado watch?" What is your understanding of a "tornado warning?" (What impact does this have on your decision making process? Do you feel the weather report is always accurate?

Question 5:
What type of warning system(s) such as sirens, text messaging, email, crawlers on the bottom of the TV screen, mass phone calls, Emergency Alert System (EAS) exist in your community to alert the general public about severe weather? In your opinion, what is the most effective warning system?

Question 6:
Do you have an Emergency Alert Weather Radio in use at home? Do you listen for weather alerts? Where do you get weather alerts?

Question 7:
What do you have in your disaster supply kit at home?

Question 8:
When was the last time you participated in severe weather exercises within your community? What type of exercise was it (drill, tabletop, functional and/or full-scale)? What is the role of emergency management during exercises and disasters? What role did broadcast media play in the exercise?

Question 9:
In your community that you live in, what language other than English is spoken? Do you receive information about emergency preparedness, evacuation or fire drills? Do you have any non-English speaking residents in your community? Do you know if information about the fire drill is provided in their native language?

Appendix K: Public Focus Group #2

Question 1:
Have you ever personally been involved in a severe weather emergency such as tornadoes, ice storm, flooding, etc.? If so, did this experience impact your level of preparedness for future emergencies? If so, how?

Question 2:
If you were told by a government agency to leave your area within five (5) minutes or you will die, would you leave? (How many would leave? (Show of hands.)) If not, why? If so, when will you leave, where will you go and how will you get there? Would you leave because of the risk associated with the emergency?

Question 3:
Where do you get up-to-date severe weather alerts and weather information? What station would you get severe weather updates from? How do you view the quality of the information received? How do you view the timeliness of the information? Is this information easy to understand and interpret?

Question 4:
What is your understanding of a "tornado watch?" (How many know what a "tornado watch" is? (Show of hands.)) What is your understanding of a "tornado warning?" (How many know what a "tornado warning" is? (Show of hands.)) What impact does this have on your decision making process? Do you feel the weather report is always accurate?

Question 5:
What type of warning system(s) such as sirens, text messaging, email, crawlers on the bottom of the TV screen, mass phone calls, Emergency Alert System (EAS) exist in your community to alert the general public about severe weather? In your opinion, what system do you think is most effective and why?

Question 6:
Do you have an Emergency Alert Weather Radio in use at home? Do you listen for weather alerts? Where do you get weather alerts? How do you get emergency alerts in your car? How do you get emergency alerts at work?

Question 7:
What do you have in your disaster supply kit at home?

Question 8:
When was the last time you participated in severe weather exercises within your community? What type of exercise was it (drill, tabletop, functional and/or full-scale)? What is the role of emergency management during exercises and disasters? What role did broadcast media play in the exercise?

Question 9:
What languages other than English is severe weather information provided in languages other than English? What type of broadcast media provides this type of information in languages other than English? Do you know of any case history of language barriers within Tennessee causing injury or death?

Appendix L: Public Focus Group #3

Question 1:
Have you ever personally been involved in a severe weather emergency such as tornadoes, ice storm, flooding, etc.?

Question 2:
Where do you get up-to-date severe weather alerts and weather information?

Question 3:
What station(s) (TV and/or radio) do you get severe weather updates from?

Question 4:
What is your understanding of a "tornado watch?"

Question 4A:
What is your understanding of a "tornado warning?"

Question 5:
Is this information easy to understand and interpret?

Question 6:
What impact does this have on your decision making process?

Question 7:
Do you feel the weather report is always accurate?

Question 8:
In looking at ways that you can be alerted or receive weather information, what do you think is the most effective way that you can receive information and why?

Question 8A:
When those sirens go off, what does that mean? What are they trying to communicate to you?

Question 9:
Some of you mentioned text messaging about severe weather. Do any of you subscribe to a service that you will receive that type of information?

Question 10:
A lot of you say you watch TV and watch weather on TV that's in English. For those of you from the non-English speaking community, that presents some challenges for you. What type of challenges do you have to overcome to understand what these meteorologists are telling you?

Question 11:
Do you have an Emergency Alert Weather Radio in use at home?

Question 12:
Where do you get weather alerts?

<u>Question 12A:</u>
Are all of the severe weather reports in Spanish in regards to Hispanic radio stations/channels?

<u>Question 13:</u>
What do you have in your disaster supply kit at home?

<u>Question 14:</u>
If you were told by a government agency to leave your area within five (5) minutes or you will die, would you leave?

<u>Question 14A:</u>
If so, when will you leave, where will you go and how will you get there?

<u>Question 14B:</u>
Would you leave because of the risk associated with the emergency?

<u>Question 15:</u>
What should you do if you hear the community sirens?

Appendix M: Broadcast Media Focus Group

Question 1:
Where do you get up-to-date severe weather alerts and weather information? How do you view the quality of the information received? How do you view the timeliness of the information? How easy is this information to understand and interpret?

Question 2:
Broadcast stations have established triggers for severe weather watch and warning alerts for their viewing and listening audience. What are the triggers for getting severe weather watch and warning alerts to your audience? What are the criteria for interrupting pre-recorded broadcast?

Question 3:
How much personal risk would you take to keep the public safe? If your studios are not available, what is your contingency plan to move enough equipment to the transmitter site to keep running? What is your plan on how to communicate with the studios when the phones are down? How do you contact additional staff to handle emergencies that are beyond just needing the staff engineer? How do you notify secondary engineers and people on call in case your engineer is tied up with an emergency situation? Does your broadcast engineer have credentials to get to the station if the station is in the disaster area or to get past road blocks?

Question 4:
What type of emergency response training does decision-makers, air personalities, engineers, and staff receive? What type of emergency preparedness training is offered by your organization on an annual basis?

Question 5:
Is your station on generator power? What within your station is on generator power? How long (in hours) can your station operate on generator power? What is your back-up plan for getting generator fuel if the roads are blocked? What arrangements do you have for a secondary source of fuel?

Question 6:
What types of warning systems exist in your community to alert the general public about severe weather? What type of emergency warning system in your community has been effective in alerting the general public? What are some of the obstacles you have faced? Which emergency warning system would you like to have? What is prohibiting you from having it if you do not have it? How would you sustain such a system if you were allowed to purchase it?

Question 7:
Tell me about your relationship with local authorities (Emergency Management, Fire, Law Enforcement, and Emergency Medical Services)? Which response agencies do you have working relationships with? When was the last time you met with local authorities to discuss emergency preparedness?

Question 8:
What do you think is the general public's understanding of your role in alerting them? When was the last time you met with the general public about your emergency alerting capabilities? What did you discuss in your meeting and what were the outcomes?

Question 9:
When was the last time you participated in severe weather exercises within your community? What type of exercise was it (drill, tabletop, functional and/or full-scale)? What is the role of emergency management during the exercise? What role did the broadcast media play in the exercise?

Question 10:
In working with non-English speaking populations in your area, what is your capability to provide information in various native languages? Give examples. What capabilities do you have to provide information to the sight and hearing impaired? Give examples.

Appendix N: Meteorologist Focus Group

Question 1:
Where do you get up-to-date severe weather alerts and weather information? How do you view the quality of the information received? How do you view the timeliness of the information? How easy is this information to understand and interpret? What are the influencing factors on how the weather is presented? Does rating and advertisement play a factor? Who makes the decision as to what and when things are on the air?

Question 2:
Broadcast stations / Meteorologists have established triggers for severe weather watch and warning alerts for their viewing and listening audience. What are the triggers for getting severe weather watch and warning alerts to your audience? What are the criteria for interrupting pre-recorded broadcast?

Question 3:
How much personal risk would you take to keep the public safe? If your studios / offices are not available, what is your contingency plan for providing information to the viewing public? Do you have credentials to get to the station if the station is in the disaster area or to get past road blocks?

Question 4:
What are the regulatory requirements and/or national standards guiding the development of an emergency response plans for broadcast media?

Question 5:
People will not take action unless they are provided guidance or information from at least two different sources. How could meteorologist work better with EAS? How could meteorologist work better with telephone alerting, text alerting, cell - broadcast alerting, etc.?

Question 6:
What type of emergency response training does decision-makers, air personalities, engineers, and staff receive? What type of emergency preparedness training is offered by your organization on an annual basis? What type of family emergency preparedness planning is offered by organization / agency or made available to staff?

Question 7:
Is your station on generator power? What within your station is on generator power? How long (in hours) can your station operate on generator power? Is there a minimum number of hours of fuel that is required to keep on hand for back-up generators?

Question 8:
What are the different components of a comprehensive emergency warning system that exist in your community to alert the general public about severe weather? Which components of this system have been effective in alerting the general public? What are some of the obstacles you have faced? Which emergency warning system would you like to have? What is prohibiting you from having it if you do not have it?

Question 9:
Tell me about your relationship with local authorities (Emergency Management, Fire, Law Enforcement, and Emergency Medical Services)? Which response agencies do you have working relationships with? When was the last time you met with local authorities to discuss emergency preparedness? Discuss your station's outreach program to the first responder community. (i.e.- education, flyers, maps, etc.)

Question 10:
What do you think is the general public's understanding of your role in alerting them? When was the last time you met with the general public about your emergency alerting capabilities? What did you discuss in your meeting and what were the outcomes? Discuss your station's public severe weather outreach program for the general public. (i.e.- education, announcements, flyers, maps, etc.)

Question 11:
When was the last time you participated in severe weather exercises within your community? What type of exercise was it (drill, tabletop, functional and/or full-scale)? What is the role of emergency management during the exercise? What role did the broadcast media play in the exercise?

Question 12:
In working with non-English speaking populations in your area, what is your capability to provide information in various native languages? Give examples. What capabilities do you have to provide information to the hard of hearing community? Give examples.

Question 13:
What impact does tornado false alarms have on your viewing audience? Do feel the weather service has cried wolf to many times? What impact do you feel this has impacted your listening audience?

Appendix O: Emergency Management Focus Group

Question 1:
Where do you get up-to-date severe weather alerts and weather information? How do you view the quality of the information received? How do you view the timeliness of the information? Is this information easy to understand and interpret?

Question 2:
What types of warning systems exist in your community to alert the general public about severe weather? What type of emergency warning system in your community has been effective in alerting the general public? What are some of the obstacles you have faced? Which emergency warning system would you like to have? What is prohibiting you from having it? How would you sustain such a system if you were allowed to purchase it?

Question 3:
County Emergency Management Agencies have established triggers for severe weather watch and warning alerts for their area. What are the established triggers for getting severe weather watch and warning alerts out to the broadcast media and to the general public? Does your agency have automatic severe weather triggers? Has your county authority established protocols to share emergency alert information with other response agencies within your county? Has your county authority established protocols to share emergency alert information with other response agencies outside your county?

Question 4:
What is your relationship with the broadcast media (TV and Radio) in your area? Which broadcast media (TV / Radio) do you have working relationships with? Do you feel the weather report is always accurate?

Question 5:
What is the general public's understanding of your role in alerting them? When was the last time you met with the general public about your emergency alerting capabilities? What did you discuss in your meeting and what were the outcomes?

Question 6:
With a severe weather event fast approaching with someone reluctant to evacuate their home, would you tell them they may die if they stayed? How could you communicate the risk differently?

Question 7:
In working with non-English speaking populations in your area, what is your capability to provide information in various native languages? Give examples. What capabilities do you have to provide information to the sight and hearing impaired? Give examples.

Question 8:
When was the last time you participated in severe weather exercises within your community? What type of exercise was it (drill, tabletop, functional and/or full-scale)? What is the role of emergency management during exercises and disasters? What role did the broadcast media play in the exercise?

Question 9:
How long can your EOC operate on generator power? What within your building is on generator power? What is your back-up plan for how to get generator fuel if the roads are blocked? What arrangements do you have for a secondary source of fuel?

Appendix P: Data Coding

Public Focus Groups

Codes	1	2	3	4	5	6	7	8
	Communications	Preparedness	Knowledge	Experience	Training & Drills	Warning Technology	Perceived Risk	Assistance
caution				x				
collaboration								x
communication	x							
concern for public safety							x	
Cost issues						x	x	
credentials	x		x	x				
details of messages	x							
effectiveness of messages	x							
emergency drills					x			
expectation of help/aid								x
experience adding to current ideals/behaviors				x				
expert training					x			
false alarms	x							
Ideas for improvement					x	x		
immigration status							x	
Jurisdiction issues	x		x	x		x	x	
knowledge of varying systems			x			x		
lack of knowledge of particular systems			x					
level of preparedness		x						
limited coverage						x	x	
logistical delivery issues								x
methods/means of preparations		x						
opinions of current systems						x		
perceived risk during emergency							x	
personnel limitation							x	
police intervention							x	x
possible danger							x	
prior experience with weather emergency			x	x				
Public education					x			
public response to messages	x		x					
quality of information	x							
social media	x							
sources of emergency info	x	x	x					
Spanish systems/ messages	x					x		

testing for effectiveness					x			
translation issues	x							
trust of warning systems	x		x			x	x	
understanding of messages	x		x					
unorganized messaging	x							
Use of technology						x		
vulnerability of population							x	
warning standards						x		
widespread coverage			x			x		
would leave							x	